A close-up photograph of a Sharp EL-W506 WriteView scientific calculator. The screen displays the fraction "4/5" in black on a light green background. Above the screen, the text "SHARP" and "EL-W506" are visible, along with the "WriteView" logo. Below the screen, several menu options are listed: "MODE", "ON/OFF", "1:STAT", "2:DRILL", "3:POLY", "4:ANALY", "5:GRAPH", and "6:TABLE".

SHARP  
EL-W506  
WriteView

4/5

MODE ON/OFF 1:STAT 2:DRILL 3:POLY 4:ANALY 5:GRAPH 6:TABLE

# calculatormathematics

by:reynold aquustin

# CALCULATOR MATHEMATICS

## SHARP VERSION

*Reynold Agustin*

CalQ Publishing  
Manila, Philippines

E-add: rma-jj@yahoo.com

## **Calculator Mathematics: SHARP Version**

**Copyright 2009**

**by Reynold Medrano Agustin**

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**introduction****more praises from happy readers....**

“What an amazing way to present Mathematics! I like the part where Engr. Agustin reiterated the importance of understanding Mathematics the “old school” way because I certainly agree that the development of mathematics skills cannot be honed by even the most advanced calculator that we have today. Truly, a work done by extraordinary heart and mind.”

*Engr. Rodolfo Aquino, PME, Vice President, PSME - Mla.*

“Simply amazing! It’s definitely an Engineering Student must-have! Congratulations for being the FIRST and ONLY engineer to have established a promising field of Mathematics at a very young age. I won’t be surprised if other Engineers will adopt your concept.”

*Engr. Jonathan Espeleta, Respected Math Reviewer for over 20 years*

“Calculator Mathematics opened an untouchable approach that makes every student fall in love with Mathematics. It could be the Math Haters Clubs’ answered prayer. I never knew my calculator can solve problems in Calculus, Differential Equations, and Economy! “

*Engr. Rowel Allan Rocaberte, 3rd Placer EE Board Exam, 6th Placer, ECE Board Exam*

## introduction

“One of the most useful books for board exam is Calculator Mathematics by Reynold M. Agustin. It helps students know more about their calculators especially its functions. It highlights the step-by-step procedure in solving a problem using a calculator in a very concise and informative manner. It even shows the actual calculator output!”

*[www.reviewdynamics.wordpress.com](http://www.reviewdynamics.wordpress.com)*

“If you want to appreciate Mathematics the “engineers’ way”, make sure you have a copy of Calculator Mathematics. Engr. Agustin was able to showcase the prodigious power when technology is used effectively in Education. I can’t wait for your next book, Sir!”

*Engr. Ferdinand Sanchez, 1st Placer, ECE Board Exam*

“Calculator Mathematics is not just a book—it’s a portal that opens up to new world of exciting possibilities in mathematics. Calculator Math is a very helpful tool for engineering students in changing their impression about math subjects. The amount of help it gives to students who are reviewing for the board exams, or just simply studying for their math subjects in schools, is indeed very valuable. This is the reason why Calculator Math is steadily gaining support and popularity among schools and review centers throughout the country.

*Engr. James Gonzales, Awardee, Jaycees Int'l Outstanding Student*

*To my Mama Cora and my Ading Bong, Lou Ann and Khiel - the greatest family  
one can ever ask for*

## introduction

I am humbled by the extraordinary testimonials for Calculator Mathematics given by a roster of Respected Engineers, Mathematicians, Achievers, Topnotchers, and ordinary students. I am not sure if everybody who has the courage to write a book gets the same recognition but let me thank all of you who believed in what most people thought was just a plain income generating hype in the beginning written by a 23- year old inexperienced chemical engineer. It maybe hard to believe but I myself was also a little pessimistic at the start and you can't blame me because if you look at

the profiles of the previous authors of mathematics books, at that time the youngest was almost double my age. But with the help of the Big Guy above, despite very minimal efforts for marketing, the printing never ceased and who would've thought, another book will be under my name, the much awaited sequel of Calculator Mathematics.

While many have called my book as "anti-formula", or "math-haters bible", it is not my intention to ruin the development of mathematical ability of each student. I still recommend every user of this book to learn the school method so that each student will understand the entire process of solving and will not just believe on whatever that their calculator screens will display. The ability to develop the Mathematical analysis, which is very important in real life situations, cannot be completely honed by using even the most advanced calculator that we have today.

In order to make Mathematics more interesting, which is one of the major objectives of Calculator Mathematics, I decided to come up with a lay-out that is more visually stimulating. In this way, I did not only simplify mathematics using technology but also presented the subject in a likable format. The SHARP – version presented many explorations which were not included in the 1st book. Parametric Equations in Calculus, Depreciation problems in Engineering Economy, and Applications of the First Order Differential Equations to name a few, were thoroughly explained so that anybody who uses SHARP EL-W506 will find the calculator more interesting and helpful. This one of a

kind book uses the functions you can only find in SHARP EL – 506 in its full potential.

It is always my joy to share my knowledge to everyone and I am very grateful to the Father Almighty for the wisdom, courage and determination he has bestowed on me. First in the list, I thank my mother, Mama Cora and for my ading, Bong for being there with me no matter what. Both of you have inspired me to be successful each day.

I wouldn't be in this position if not because of the belief that the Engineering Review Centers from all over the Philippines has given me especially when I was just starting. I salute all of you and I truly have very high respect to all Reviewers in the field of Engineering especially to my former teachers, Dr. Carlito Salazar, Dr. Leonardo Medina, Engr. Vergel Bungay, and Engr. Joseph Rex Uy. Thank you also to all Universities from all over the Philippines that believed in me and supported my advocacy regarding Educational Technology.

Likewise, my sincerest gratitude to the help extended by **Mr. Carmelo Flores**, and to the people of Collins especially to **Miss Julie Lim** and **Mr. Lucero Ong** for their invaluable support to make this project possible. Thank you very much. I would like also to extend my gratitude to the people who helped in arranging the script especially to **Mr. Joseph Michael Torrijos**, **Architect Major Pascua**, **Engr. Angelo Roque**, **Mr. Ronald Rocio**, **Miss Jenny Medrano**, **Miss Henny Agustin**, and **Architect Arnaldo Marzo**.

## introduction

And lastly, to all my cousins both in and out of the Philippines, to my former professors in UST, the USTEAA(USA), former classmates, gimikmates (Rosamia), former friends, present friends, you guys rock!

When you find errors, or sections of this book that are unclear, I would appreciate if you will let me know. You can visit our sites, [www.friendster.com/calculatormathematics](http://www.friendster.com/calculatormathematics), [www.enggcentral.multiply.com](http://www.enggcentral.multiply.com), or email us at [calculatormathematics@yahoo.com](mailto:calculatormathematics@yahoo.com)

Engr. Reynold Agustin  
[ice.agustin@yahoo.com](mailto:ice.agustin@yahoo.com)

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**introduction**

A **calculator** is a small electronic device or mechanical device for performing mathematical calculations that requires manual action for each individual operation. It is distinguished from a computer by a limited problem solving ability and an interface optimized for interactive calculation rather than programming. Calculators can be hardware or software, and mechanical or electronic, and nowadays, are often built into devices such as PDAs or mobile phones.

### Brief History

Over the years, calculators have evolved from the simple tally sticks, comptometers, Napier's bones, books of mathematical tables, slide rules and Roman Abaci to the kind of

calculators that we enjoy today. Calculators available today are now electrically powered (usually by battery and/or solar cell) and vary from cheap, give-away, credit-card sized models to sturdy adding machine-like models with built-in printers. As technology continues to fulfill humankind's unending search for possibilities, the power of calculator becomes clearer and more helpful for all of us.

As we progress with time, modern calculators are becoming cheaper, more advanced, smaller in size, and more stylish. Today, subject-specialized calculators are making their names in the market. These are those calculators specifically made for a particular subject matter. Scientific and Financial calculators are good examples. Pocket size calculators are also becoming popular. Other calculator manufacturers are now releasing not just colorful but are also powerful calculators that are capable of solving problems in Calculus and Advanced Mathematics, which, was just a dream during the past.

## **Use in Education**

The developed countries started the use of calculators in higher schools. Although the idea was resisted at first, it is now fully

accepted. In fact, calculators are now allowed even during exams in college where tedious calculations can be simplified but not risking the analytical ability of the student in the subject matter. In some countries, the use of calculator is also allowed even in taking the professional licensure examinations.

In the Philippines, the usage of calculator in schools has long been accepted although there are still some educators that prohibit their students from using these devices especially during examinations. The more technologically-inclined Universities however encourage their students to maximize the potentials of their calculators and make it work for them.

## introduction

### Calculator Issues

Despite many efforts of calculator manufacturers worldwide in the advancement of technology based education, some countries don't have the access to the technology yet. In many cases, if they have access to the technology, the inability to maximize or even use the technology is another big problem. This is happening to many developing countries all over the world.

The number one issue, which is determining the proper time to introduce a calculator to a student, still remains a big question. Educators fear that calculator in school might suffer the

basic arithmetic skills of the students. The debate on the power "of the hand" or "in the mind" is still hanging until Educators will solved the issue as to when be the proper time to introduce a calculator to a student.

While many teachers are delighted with the use of calculator in schools, others argue that calculator use can deteriorate the core mathematics skills. According to research, inadequate guidance in the use of calculator can restrict the kind of mathematical thinking that students engage in.

The calculator power seems to be always correct as soon as the equal sign is pressed and an answer is displayed. There is a little issue there because the student might not be fully aware of the entire procedure and might not understand the principle behind each computation. Furthermore, he might believe that everything that will be displayed is already the correct answer. If this happens the true essence of calculator is not achieved. Instead, it becomes a liability and it could slow down the development of one's mathematical ability.

## introduction

The second issue is the proper use of calculators. People have always thought that calculators are mere simple electronic devices that using it is purely a matter of "pressing the keys" just like a piano. But just like the piano, the music will never come out until the right keys are pressed and only then it will have a perfect sound.

In the seminars which I've conducted in many Universities, I am surprised how students fail to maximize their calculators. What is really unbelievable is the inability of their professors to know the abilities of their students' calculators. In that case, the professor fails to check whether his student is using a super powerful calculator that might already have the ability to store the answers of his examinations, and therefore, nullifies the purpose of the exam.

Many University Professors neglect to update themselves on the current trends of calculator technology and therefore, misses the unimaginable benefits brought about by these amazing inventions.

### Why SHARP?

There is more than just the sturdy design that makes SHARP EL-W506 very competitive in the calculator arena. These include the following.

- The solid 556 functions which can be recalled using the built-in catalog function and can be stored on the function keys D1-D4 which works as the short-cut key.
- Write-view (Sharp trade mark) 4 line capability for displaying the full set of information on numerical evaluations of integrals and de-

## introduction

derivatives as well as any other algebraic manipulations. This is equivalent to the SVPAM or VPAM available on other calculator brands.

- The "Change" key to convert from one format to another or vice versa, i.e., decimal to fraction.
- Built-in 52 Physical Constants and 44 Conversion Factors with their corresponding units.
- Frequently used expressions that you are free to create can be quickly and easily stored on the special keys F1-F4 for repeating computations. These same keys (unshifted) can also be used for a very useful multi-line playback of results as well. There are also separate D1-D4 keys (directly above the F1-F4 keys) for memory and expression storage as well giving the Sharp a large number of memory locations.
- It has the ability to evaluate 4th order matrices, not to mention its ability to store four matrices all at the same time.
- There is a memory that takes charge even if the calculator has turned off due to inactivity for ten minutes. This means that the last calculator display is well saved and not lost in the cyberspace.
- The solution of quadratic and cubic equations has an added feature that solves the determinant when the coefficients of the equations are to be used as an element that forms a matrix.
- It can be personalized by putting your own name in the calculator.

A person who doesn't know how to convert units is facing a disaster. Most of the examinations given in schools require knowledge in converting units in order to arrive at the correct answer. At the moment, the International System of Units (abbreviated SI from the French Le Système International d'Unités)

is the modern form of the metric system and is generally a system devised around the convenience of the number ten. It is the world's most widely used system of measurement, both in everyday commerce and in science.

SHARP EL – W506 has a total of 52 Physical Constants and 44 Metric Conversions which are based on the 2006 CODATA recommended values, or on the 1995 Edition of the "Guide for the Use of the International System of Units (SI)" released by the National Institute of Standards and Technology.

### How to convert units?

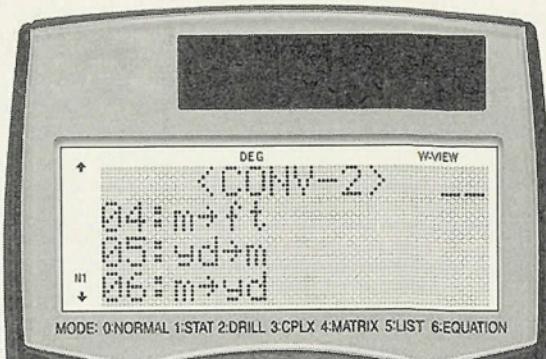
There are only two general procedures that must be followed when converting units using Sharp EL – W506 and these are enumerated below.

1. Write in your calculator the unit to be converted.
2. Use the programmed conversion factor in your calculator and press the equal sign.

*Example 1. Giant Sequoia*

The tallest tree in the world is a coast redwood (*Sequoia sempervirens*), named Hyperion after a person in Greek mythology. He is no less than 115.55 m. This enormous tree was discovered only in August 2006 in a remote part of the Redwood National Park, California by naturalists Chris Atkins and Michael Taylor. Express the height of this tree in feet.

As a general rule, the unit to be converted must be correctly written on the calculator first before any conversion will proceed.



*Solution:*  
*Step 1.*

**Enter the unit to be converted**

1 1 5 . 5 5

*Step 2.*

**Press the corresponding conversion**

2<sup>nd</sup> F   CNST   0   4   =  
(CONV)



This special feature of Sharp EL-W506 allows the user to use the Conversion and Physical constant part of the calculator even without the cover which normally holds a list of this feature. This gives the user the edge to instantly maximize this function even without the help of the cover.

*Example 2. Bloodline*

According to studies, as your heart pumps in one day, your blood travels nearly 12,000 miles. How much is this distance in kilometers?

FYI, 12,000 miles is already one half the circumference of the Earth when measured at the Equator. This distance is also three times the length of the Nile River, the longest river on Earth!



1 2 0 0 0

*Solution:*

**Step 1. Enter the unit to be converted**

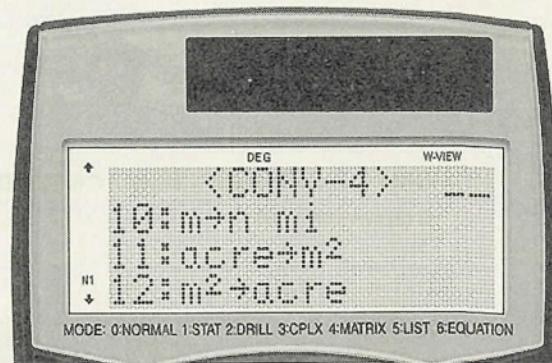
Step 2. Press the corresponding conversion

2<sup>nd</sup>F   CNST   0   7   =  
(CONV)



*Example 3. Largest European Island*

**Great Britain is the largest island in Europe constituting 229,957 sq km in land area. This is closely followed by Iceland and Ireland respectively. How much is this area in acre?**



Since there is no direct conversion from square kilometers to acres, you must first convert the given from square kilometers to square meters using the conversion factor 1 kilometer = 1000 meters. Only then the stored conversion from square meters to acres will be put into usage.

*Solution:*

*Step 1.*

**Enter the unit to be converted**



2 2 9 9 5 7 × 1 0 0 0  $x^2$

*Step 2.*

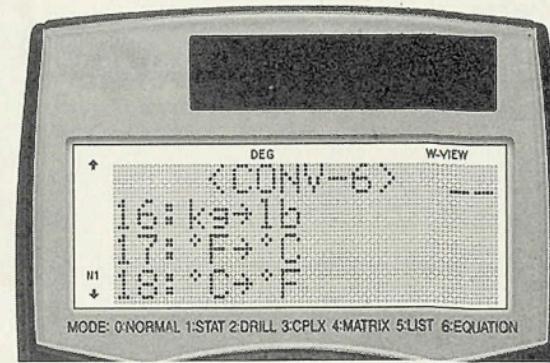
**Press the corresponding conversion**

2<sup>nd</sup> F CNST 1 2 =  
(CONV)

*Example 4. Boiling Point*

The boiling point of water at the top of Mount Everest is approximately 69 degrees Celsius, or 31 degrees below the boiling point of water at sea level. This is due to the pressure difference caused by altitude. What is the boiling point of water at the top of Mount Everest in the Fahrenheit scale?

FYI, Antarctica, the officially coldest place on the planet has an average year-round temperature of -50 degrees Celsius while the warmest place on the planet is in Ethiopia where the average yearly temperature is 35 degrees Celsius.



*Solution:*

*Step 1.*

Enter the unit to be converted

6

9

*Step 2.*

**Press the corresponding conversion**

2ndF CNST 1 8 =  
(CONV)



The method of converting a unit to another using your calculator is really simple. It doesn't matter what unit you are converting for as long as you follow the two simple steps illustrated in the examples given.

## How to reveal Physical constants?

Revealing the Physical Constants in SHARP EL – W506 should never become a problem for the user since all Physical constants are programmed in such a way that you don't need to memorize their locations anymore. Pressing the CONSTANT key will automatically give you the Physical constants in table form with their corresponding symbols.

A total of 52 scientific constants and 44 conversion constants are saved in your calculator.

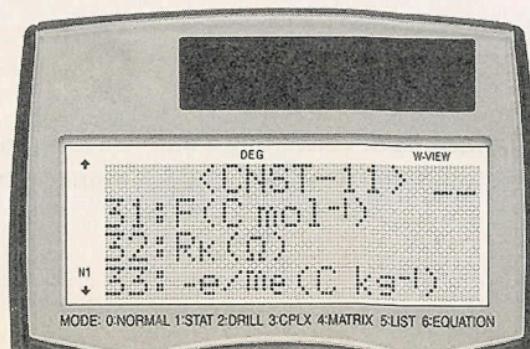
### *Example 5. Von Klitzing Constant*

**Klaus von Klitzing became the 1985 recipient of the Nobel Peace Prize for Physics for his contribution in the field of electromagnetism. What is the Von Klitzing constant?**

#### *Solution:*

Press the corresponding key and the calculator will automatically display the value.

CNST      3      2



the problem



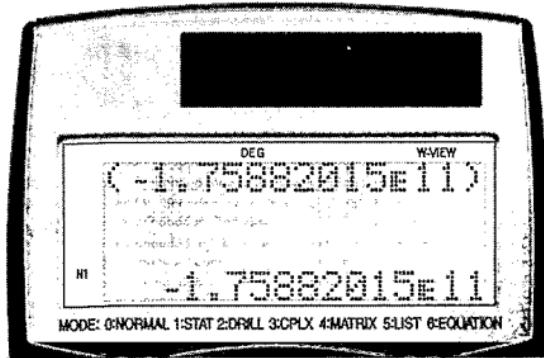
is it?



**Joseph John Thompson received the Nobel Peace Prize in Physics in 1906 after discovering the electron charge to mass quotient. What is the value of this constant?**

- A. -1.7588 exp 11 C/kg
- B. 2.34 exp -20 C/kg
- C. 6.022 exp 23 C/kg
- D. 8.314 C/kg

1



Input and the Answer is!

applications in conversion

click This!

CNST    3    3    =

**28**

applications in conversion

**2**  
the problem



is it?



click This!

- A. 9.109 exp -31 kg
- B. 1.673 exp -27 kg
- C. 6.674 exp -11 kg
- D. 1.675 exp -27 kg

CNST 0 5 =

In Physics, what is the mass of  
a proton?



... and the Answer is!

the problem



is it?



The most famous formula of all time is definitely the formula derived by the Person of the Century himself; Mr. Albert Einstein which is  $E = mc^2$ . The E stands for energy, m is for mass and c is for the speed of light in a vacuum. What is the speed of light in vacuum?

- A. 2.998 exp 7 m/s
- B. 2.998 exp 8 m/s
- C. 2.998 exp 9 m/s
- D. 2.998 exp 10 m/s

3



applications in conversion

click This!

CNST 0 1 =

...and the Answer is!

4  
the problem



is it?



click This!

- A. 2.343 exp -8 W m<sup>-2</sup> K<sup>-4</sup>
- B. 3.432 exp -8 W m<sup>-2</sup> K<sup>-4</sup>
- C. 5.670 exp -8 W m<sup>-2</sup> K<sup>-4</sup>
- D. 9.109 exp -8 W m<sup>-2</sup> K<sup>-4</sup>

CNST 2 7 =

What is the Stefan-Boltzmann constant?



... and the Answer is!

the problem



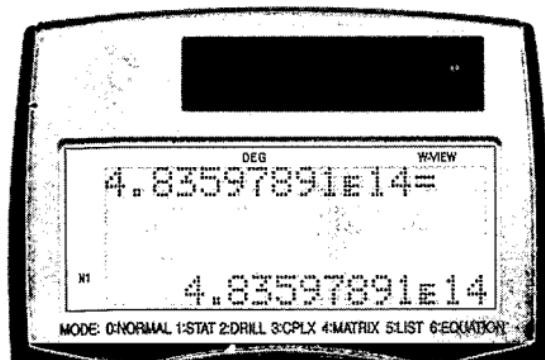
is it?



In electromagnetism, what is the value  
of the Josephson constant?

- A. 1.111 exp 14 Hz/V
- B. 2.222 exp 14 Hz/V
- C. 5.345 exp 14 Hz/V
- D. 4.836 exp 14 Hz/V

5



applications in conversion

click This!

CNST    3    6    =

...and the Answer is!

**6**  
the problem



is it?



click This!

- A. 9.649 exp 4 C/mol
- B. 5.098 exp 4 C/mol
- C. 3.321 exp 4 C/mol
- D. 5.779 exp 4 C/mol

CNST 3 1 =

What is the magnitude of electric  
charge per mole of electron?



... and the Answer is!

**the problem**



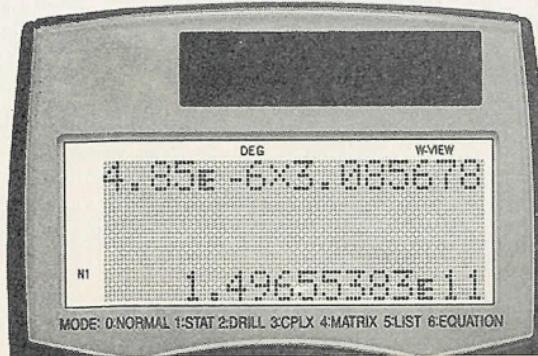
**is it?**



The Sun, center of the solar system, is approximately  $4.85 \times 10^{-6}$  pc (parsec) away from our planet Earth. How far is the sun from the Earth in terms of meters?

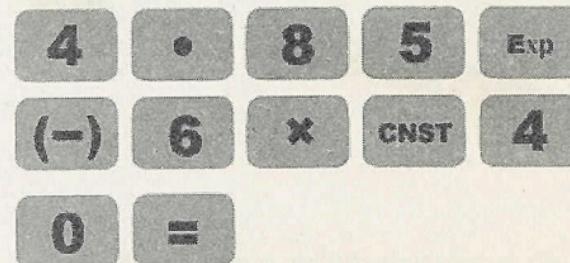
- A.  $5.11 \times 10^{11}$  meters
- B.  $2.45 \times 10^{11}$  meters
- C.  $1.50 \times 10^{11}$  meters
- D.  $9.11 \times 10^{11}$  meters

**7**



applications in conversion

**click This!**



... and the **Answer** is!

**8**  
the problem

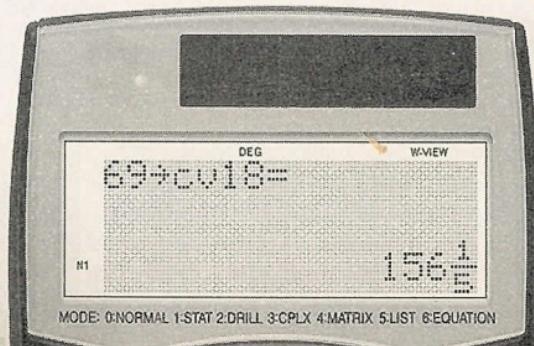
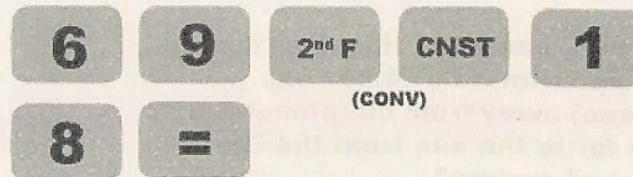


is it?

Due to pressure difference, the boiling point of water at the top of Mount Everest is only 69 degrees Celsius. What is its boiling point in degrees Fahrenheit?

- A. 150.3 deg F
- B. 156.2 deg F
- C. 160.8 deg F
- D. 175.5 deg F

click This!



... and the Answer is!

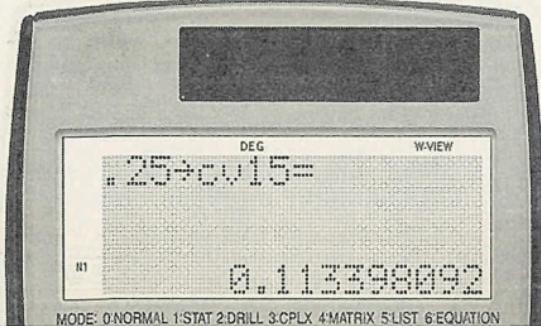
**the problem**



The famous quarter pounder burger is approximately how many kilograms?

- A. 0.25 kilograms
- B. 0.21 kilograms
- C. 0.11 kilograms
- D. 0.50 kilograms

**9**



applications in conversion

**click This!**



another **Answer..**

**10**  
the problem

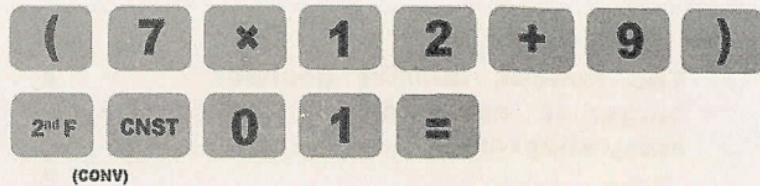


is it?

Yao De-Fen of China currently holds the record as the tallest woman alive at 7'9". How tall is Yao De-Fen in centimeters?

- A. 340 centimeters
- B. 236 centimeters
- C. 254 centimeters
- D. 199 centimeters

click This!



... and the Answer is!

the problem



is it?



The 2008 Honda CR-V has a fuel capacity of 15.3 US gallons. How much will it cost for a full tank at Php53.5 per liter?

- A. Php2,500.00
- B. Php3,500.00
- C. Php3,100.00
- D. Php2,900.00

11



click This!

applications in conversion



12  
the problem



is it?

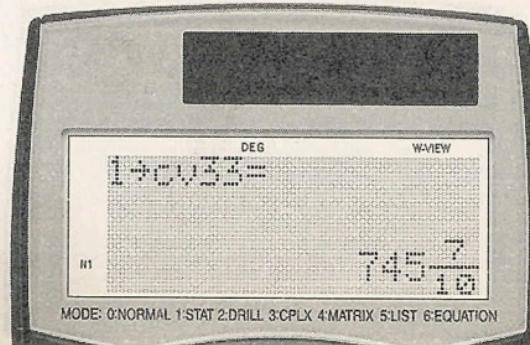
How many watts are there in one horsepower?

- A. 500 watts
- B. 745.7 watts
- C. 250 waatts
- D. 1 watt



click This!

1 2<sup>nd</sup>F CNST 3 3 =  
(CONV)



... and the Answer is!

13

the problem



is it?



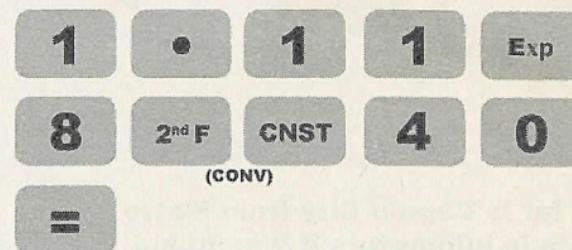
The Mariana's Trench is considered to be the deepest part of the ocean. At this point, the pressure is so strong it reaches about  $1.11 \times 10^8$  Pa. How much is this pressure in terms of the atmosphere scale?

- A. 1000 atm
- B. 1095 atm
- C. 1050 atm
- D. 3000 atm



applications in conversion

click This!



...and the Answer is!

**14**  
the problem

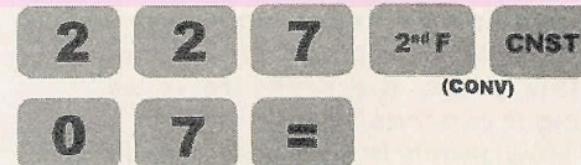


is it?

How far is Baguio City from Metro Manila in kilometers if it was found out that it is 227 miles?

- A. 150 kilometers
- B. 245 kilometers
- C. 204 kilometers
- D. 365 kilometers

click This!



... and the **Answer** is!

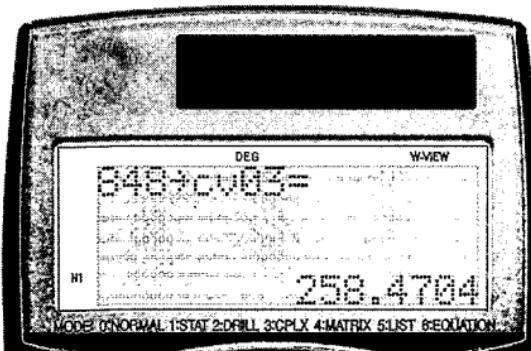
the problem



The PBCom Tower in Makati City is currently the 8th tallest building in Southeast Asia and the tallest in the Philippines at 848 ft. How tall is PBCom Tower in meters?

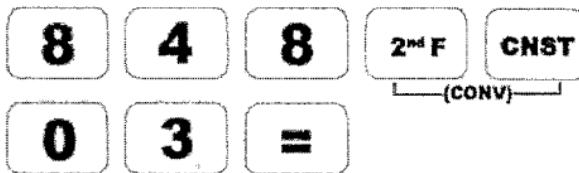
- A. 301 meters
- B. 258 meters
- C. 501 meters
- D. 367 meters

15



applications in conversion

click This!



...and the Answer is!

**16**  
the problem



is it?

Ernest Rutherford discovered the mass of proton in 1918. This quantity is how many times the mass of electron?

- A. 2000 times
- B. 1500 times
- C. 1789 times
- D. 1836 times

click This!

CNST 0 5 ÷ CNST 0 4 =



... and the Answer is!

the problem



is it?



In Chemistry, what is  
the Avogadro's number?

- A. 6.022 exp 23
- B. 6.023 exp 22
- C. 6.022 exp 24
- D. 6.022 exp 21

17



applications in conversion

click This!

CNST 2 8 =

...and the Answer is!

# 18

the problem



is it?



click This!

- A. 0.0224 m<sup>3</sup>/mol
- B. 2.24 m<sup>3</sup>/mol
- C. 2.11 m<sup>3</sup>/mol
- D. 5.67 m<sup>3</sup>/mol

CNST

2

9

=



What is the molar volume of an ideal gas at standard pressure and temperature?

... and the Answer is!

**the problem**



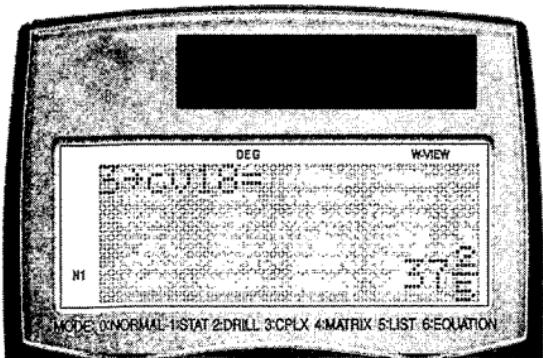
**is it?**



During the cold months of December to February, the temperature in Sagada, Mountain Province may be as low as 3 degrees Celsius. What will be the thermometer reading in this cold and serene town if it gives the answer in the Fahrenheit scale?

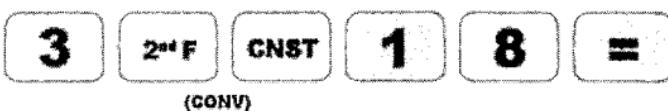
- A. 32.2 degree F
- B. 35.3 degree F
- C. 37.4 degree F
- D. 40.5 degree F

**19**



applications in conversion

**click This!**



...and the **Answer** is!

**20**  
the problem



is it?



click This!

Vatican city is a landlocked sovereign city-state whose territory consists of a walled enclave within the city of Rome. It is the smallest state in the world by both population and area. According to Wikipedia, it has a land area of approximately 110 acres. Express this area in square meters.

- A. 20,234 square meters
- B. 101,171 square meters
- C. 202, 512 square meters
- D. 311,432 square meters

1	1	0	2 <sup>nd</sup> F	CNST (CONV)
1	1	=		



... and the Answer is!

There has been amazing developments in calculator technology that permits Users to understand the basic concepts of Algebra faster. This ranges from very simple to very complicated techniques. The solution to some algebra questions however are limited to specific type of questions, I am talking about multiple choice type of questions. This allows calculator users to exploit the weakness of a multiple choice problem in a very easy manner.

## How to Use the SOLVER Function of the calculator?

This special function of SHARP EL – W506 allows the user to do a trial and error solution to equations with single variables. An equation with a single variable can be easily resolved by your calculator and the speed will depend on the complexity of the equation. For simple linear equations, the correct value can be displayed in 5 seconds or even shorter while for complicated equations, it will take 10 seconds or more.

All equations entered must follow a single format. That is, to put all the terms to the left of the equation leaving only zero on the right. This will be followed by performing the solver function which follows the Newton's Method. The correct procedure on how to properly use this special function is summarized by the 4 Important Things to Consider when Using the SOLVER Function.

## 4 Important Things to Consider when Using the SOLVER Function.

1. Make sure that every term is already transposed to the left side of the equation leaving only zero to the right.
2. The  $dx$ (iteration difference) value will determine the accuracy of the answer. The smaller the  $dx$ , the more accurate the final answer of the calculator is. For most calculators, the  $dx$  is  $1 \times 10^{-5}$ .
3. Enter a logical Initial value for the Iteration. This will determine the speed of your calculator. Remember that your calculator will follow the Newton's Method and the closer your initial value of iteration is to the correct value, the faster the computation will be.
4. Consider the degree of the equation. If solving for quadratic equations, expect two solutions, or three solutions for a cubic equation. Your calculator will display the solution that is closest to your initial value of iteration.

If the calculator gives an ERROR display this could mean any of the following:

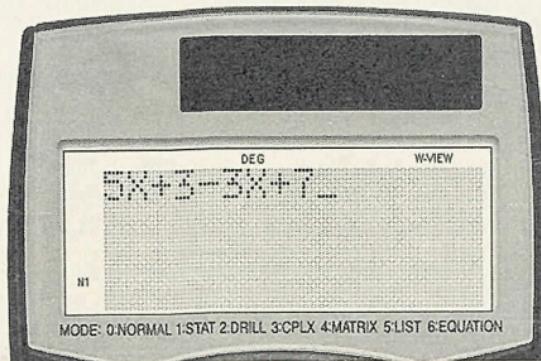
1. No solution can be found.
2. Initial value of iteration is too far from the actual value.

In order to refrain from getting an ERROR display, enter a LOGICAL initial value of iteration. For multiple choice type of questions, it is best to use any of the given choices as the initial value of Iteration.

*Example 1. Unknown x in Linear Function*

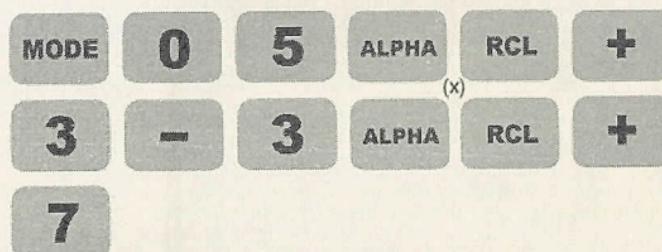
**Find the value of unknown x in the expression given:**

$$5x+3=3x-7$$



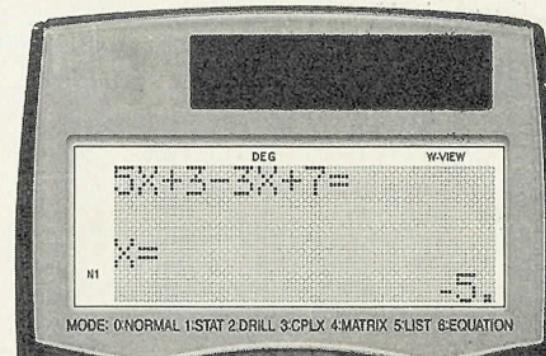
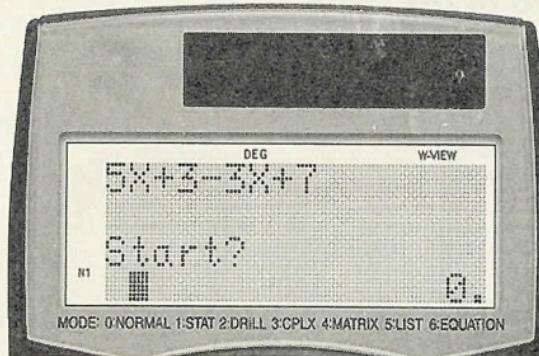
*Solution:*

**Step 1. Make sure calculator is in NORMAL mode. Write the entire equation in your calculator. Make sure all terms are transferred to the left of the equation leaving only zero to the right.**



**Step 2.** Press the solv key. Enter the initial value of iteration, iteration difference, and solve for the unknown value of x.

MATH    2    1    =    =



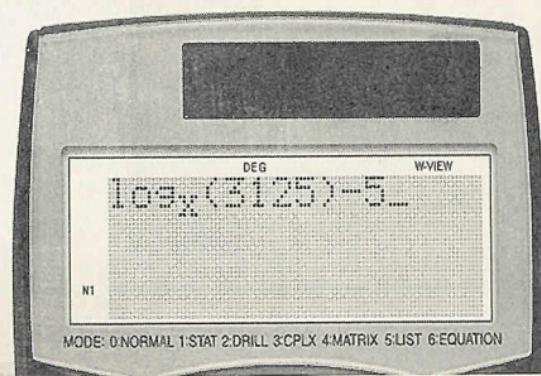
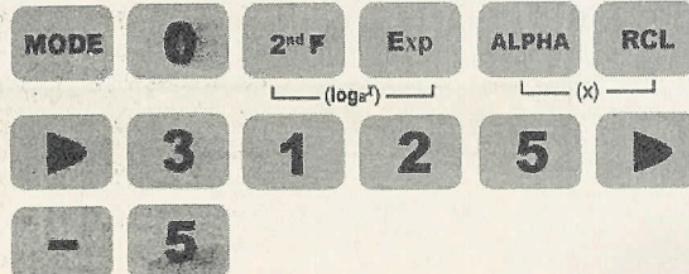
*Example 2. Unknown x in Logarithmic Function*

**Find the value of x in the expression given:**

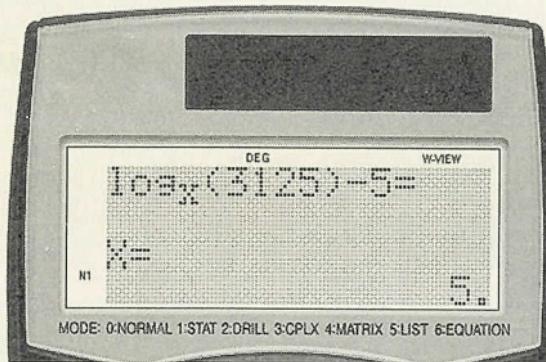
**log<sub>x</sub> 3125 to the base x equals 5**

**Solution:**

**Step 1: Make sure calculator is in NORMAL mode. Write the entire equation in your calculator. Make sure all terms are transferred to the left of the equation leaving zero to the right.**



**Step 2:** Press the SOLVER key. Enter the initial value of iteration, iteration difference, and solve for the unknown value of x.



### How to Perform Remainder Theorem in your Calculator?

The polynomial remainder theorem in algebra is an application that is very useful in evaluating polynomials. It states that the remainder, r, of a polynomial,  $f(x)$ , divided by a linear divisor,  $(x-a)$ , is equal to  $f(a)$ .

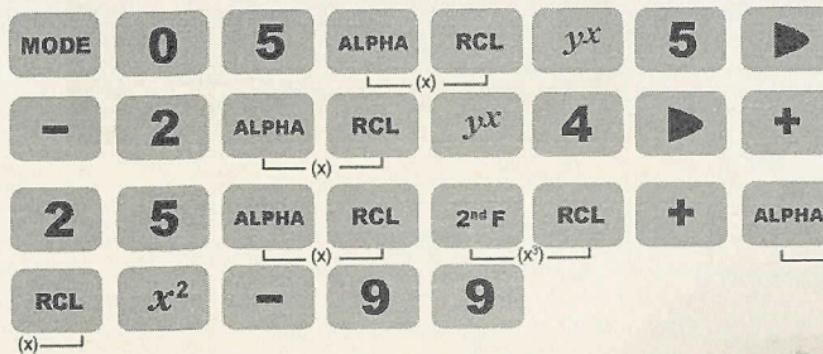
if  $f(x)$  is divided by  $(x - a)$ , then the remainder is  $f(a)$ .

*Example 3. Remainder Theorem*

**What is the remainder when the  $f(x)$  is divided by  $g(x)$ ?**

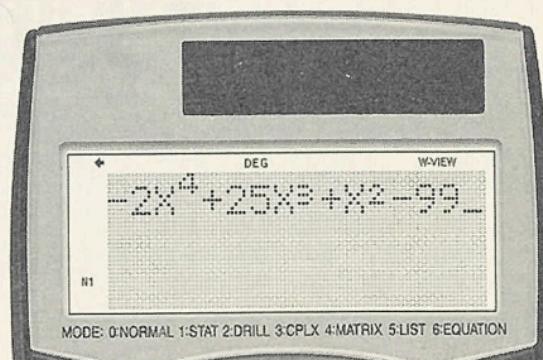
$$f(x) = 5x^5 - 2x^4 + 25x^3 + x^2 - 99$$

$$g(x) = x - 2$$

**Solution:**

**Step 1:** Equate the divisor into zero and solve for the value of x. Then we have  $x = 2$ .

**Step 2:** Write the entire dividend in the calculator



*Step 3:* Apply remainder theorem by substituting the value of  $x$  in the divisor in the entire equation.

MATH    1    2    =



*Example 4. Nature of Roots*

If the equation  $f(x)$  has only one root,  
what is the value of y?

$$f(x) = 5x^2 + yx + 5 = 0$$

A. 8  
B. 9

C. 10  
D. 11

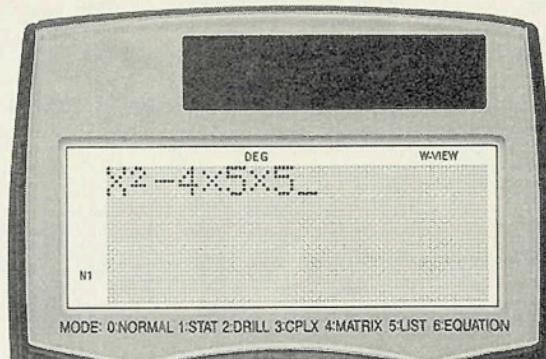
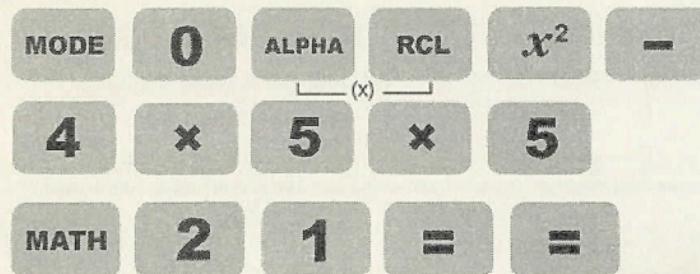
This problem can be solved if and only if you have the knowledge on the nature of roots based from the value of the discriminant. The discriminant is a value taken from the coefficients of the quadratic equation which identifies the nature of its roots. Consider the table below for reference.

Table 2.1: Nature of Roots

DISCRIMINANT	NATURE OF ROOTS
$B^2 - 4AC = 0$	real and equal (one root only)
$B^2 - 4AC > 0$	real and unequal
$B^2 - 4AC < 0$	imaginary and unequal

*Solution:*

The equation will have one real root if and only if the discriminant is equal to zero. Therefore the proper way to solve this is by using the SOLVER function of the calculator.



Note: Both -10 and +10 will satisfy the equation.

## Factoring using SHARP EL – W506

Factoring is one of the earliest lessons in elementary algebra, yet it is not easy for many students to master. Factoring using the mathematics methodology is probably among the problems in algebra that would require a lot of time especially for higher degree equations. This requires you to understand many concepts which when not fully understand, will lead to incorrect results.

Both quadratic and cubic equations can be easily factored using SHARP EL – W506 by simply accessing the EQUATIONS mode of the calculator. Higher degree factorization can also be done using the Factor Theorem or by Trial and Error. There are two considerations when using SHARP EL – W506 in factorization. First, the equation must follow the correct format leaving ONLY zero to the right part of the equation. Second, signs must be included when inputting the coefficients of the equation. Consider the next example.

## applications in algebra

## How to factor a Quadratic Equation?

*Example 5: Quadratic Equation*  
**What are the factors of the given quadratic equation?**

$$x^2 - 3x + 2 = 0$$

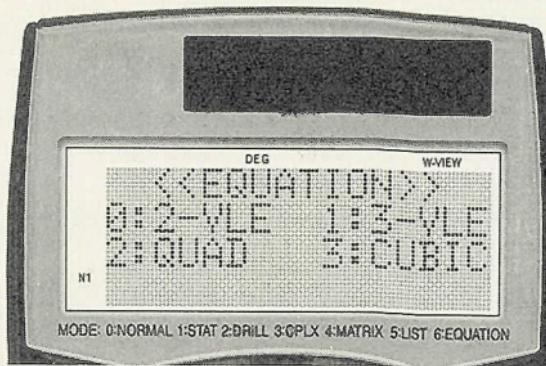
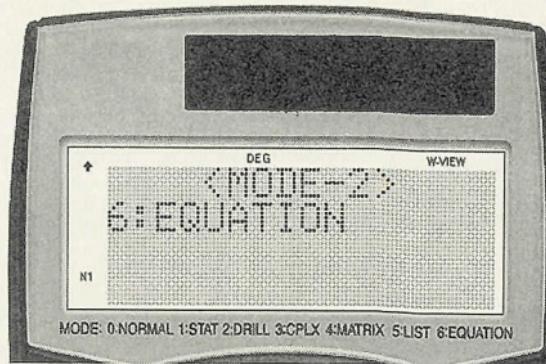
- A. 1,2
- B. 3,4
- C. 5,6
- D. 7,8

*Solution*

*Step 1:* Go to equation mode.

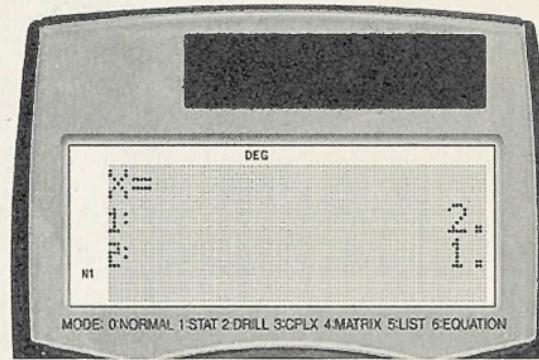
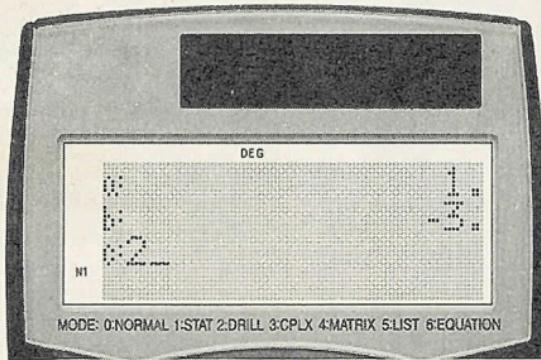


*Step 2:* Select the number that corresponds to quadratic equation.



*Step 3:* Enter the coefficients following the proper format.

1 = (-) 3 = 2 =



## How to factor a Cubic Equation?

*Example 6: Cubic Equation*

**What are the factors of the given cubic equation?**

$$x^3 + 9x^2 + 23x + 15 = 0$$

*Solution:*

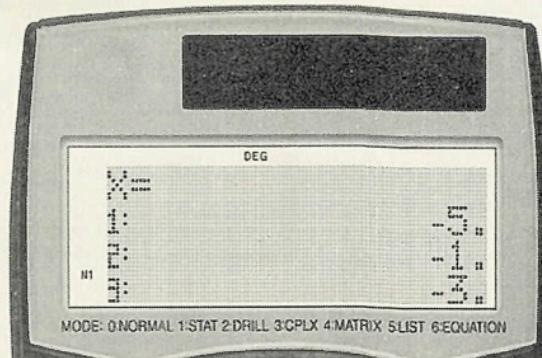
**Step 1:** Go to equation mode. Select the number that corresponds to cubic equation.

MODE    6    3



**Step 2:** Enter the coefficients following the proper format.

1    =    9    =    2  
3    =    1    5    =



## How to perform Factor Theorem in your Calculator?

The only programmed function for the calculator in factoring is for quadratic and cubic equation. Due to this, factoring nth degree polynomials using your calculator is limited. Knowledge on the Factor Theorem will be very important. The factor theorem states that a polynomial  $f(x)$  has a factor  $x - k$  if and only if  $f(k) = 0$ . Example 7 clearly discusses the factor theorem.

### *Example 7: Factor Theorem*

**Which among the given choices is a factor of the polynomial?**

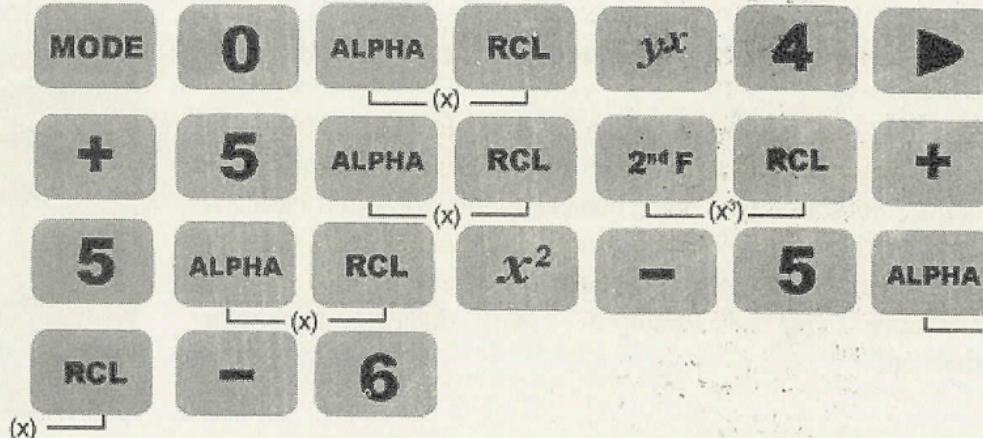
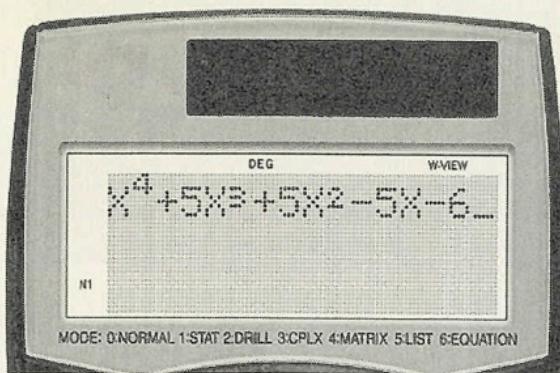
$$x^4 + 5x^3 + 5x^2 - 5x - 6 = 0$$

- A. 2
- B. 4
- C. 7
- D. 1

## applications in algebra

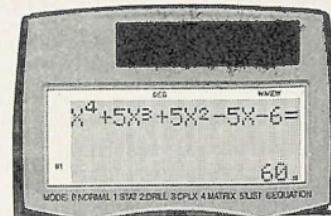
*Solution:*

*Step 1:* Make sure calculator is in NORMAL mode.  
Write the entire equation in your calculator.



**Step 2:** Apply factor theorem and do a trial and error (among the choices). The choice that will give zero when a choice is substituted will be the correct answer.

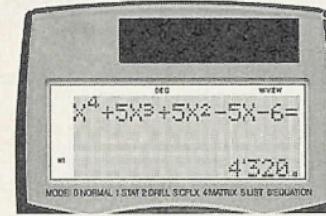
For letter A:



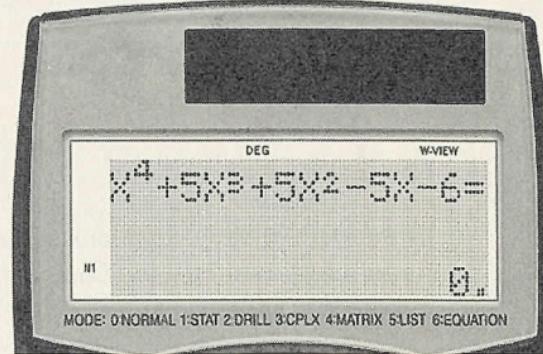
For letter B:



For letter C:



For letter D:



## How to Resolve Linear Equations?

System of Linear Equations, or simply Linear Equations is a collection of linear equations involving same set of variables. The degree of all equations remains to be 1, which is why it is called LINEAR, while the number of variables may vary, i.e., 2, 3, or 4. For example

$$2x - y + z = 6$$

$$2x - 3y - 3z = 16$$

$$x - 3y - 2z = 13$$

is a system of three equations in three variables ( sometimes known as 3 – VLE or three Value Linear Equation). A solution to a linear system is an assignment of numbers to the variables such that all the equations are simultaneously satisfied. In this example, the solutions are 2, -3, and -1 for X, Y, and Z. This means that if I substitute these three values in any of the three equations given, I will have a have an answer that is equal to the number in the right part of the equation.

*Example 8: System of Equations in 2 Unknowns*

**What is the value of X in the given system of linear equation?**

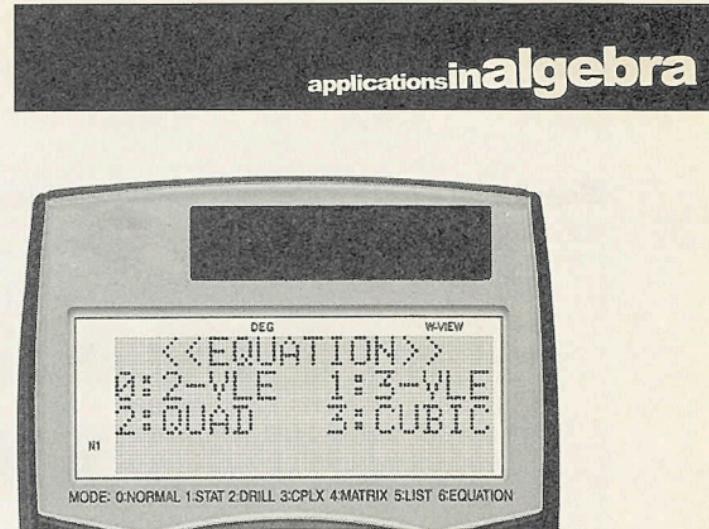
$$3x + 5y = 1$$

$$x + y = 5$$

*Solution:*

**Step 1:** Before pressing any key in your calculator, make sure that the linear equations are in the format that your calculator can read. All constants must be on the right side of the equation. Go to equation mode and select the number that corresponds to 2- value linear equation (2-VLE)

applications in algebra



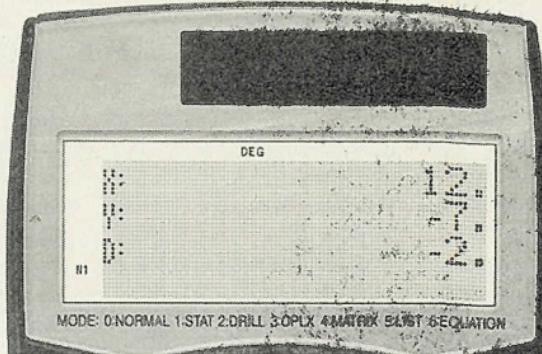
MODE

6

0

*Step 2:* Enter the coefficients of the two linear equations correctly and solve for the unknown value

$$\begin{array}{ccccc} 3 & = & 5 & = & 1 \\ 1 & = & 1 & = & 5 \end{array}$$



The D in the final answer represents the determinant of the matrix that will be formed using the coefficients of the linear equations. In this example, the matrix that is being formed is given by Matrix R

*Example 9: System of Equations in 3 Unknowns*  
**What is the value of X in the given system  
of linear equations?**

$$x + y = 4$$

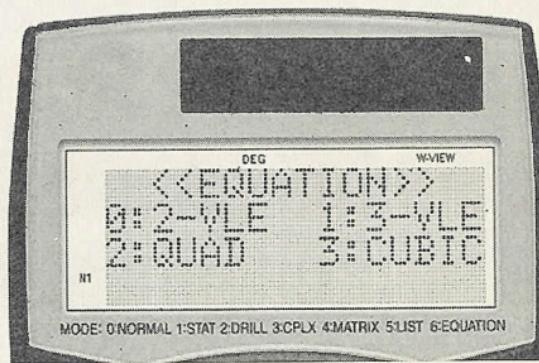
$$x + z - 1 = 0$$

$$y + z + 1 = 0$$

**Before pressing any key in your calculator, make  
sure that all the constants are already in the  
right part of each equation because this is the  
correct format that your calculator can read.**

*Solution:*

**Step 1: Go to the equation mode and select the number  
that corresponds to 3 equations 3 unknowns**



MODE      6      1

## applications in algebra

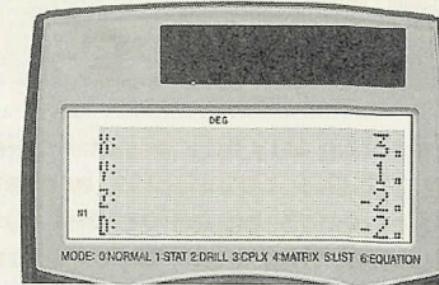
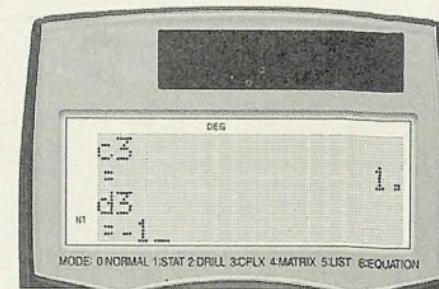
Enter the coefficients and solve for the unknown value

$$1 = 1 = 0 = 4 =$$

$$1 = 0 = 1 = 1 =$$

$$0 = 1 = 1 = (-) 1$$

$$=$$



## Progression

Progression or sequence is a set of ordered numbers that follows a trend. The more common sequences include arithmetic, geometric, and Fibonacci sequences.

**Arithmetic sequence** is a set of ordered numbers in which the difference of two adjacent terms is constant (common difference).

*example A*    2, 4, 6, 8, 10

In this example, the first term is 2 and the last term is 10. From the data given, the common

difference is 2. You can find the sum of terms by adding the terms of the sequence.

**Geometric sequence** on the other hand is a sequence of numbers in which the ratio of adjacent terms is constant (common ratio).

*example B*

3, -6, 12, -24, 48

All progressions can be summarized by a general equation of the sequence.  
In example A, the general equation is

$$\text{nth term} = 2X$$

This means that if you substitute 1 as a value for X, you will get 2 ( 1st term). If you substitute 2 as a value for X, you will get 4 (2nd term).

**Table 3.1**

X	2X	term
1	2	1 <sup>st</sup>
2	4	2 <sup>nd</sup>
3	6	3 <sup>rd</sup>
4	8	4 <sup>th</sup>
5	10	5 <sup>th</sup>

**Table 3.2**

X	$3(-2)^x$	term
0	3	1 <sup>st</sup>
1	-6	2 <sup>nd</sup>
2	12	3 <sup>rd</sup>
3	-24	4 <sup>th</sup>
4	48	5 <sup>th</sup>

Tables 3.1 and 3.2 gives us a detailed analysis of example A and example B. The first column is the value of x that is being substituted in the general equation while the second column is the element in the progression at a particular position (3rd column).

Notice that in example A, the general equation of the sequence is LINEAR while in example B, the general equation is EXPONENTIAL. This is true for *all Arithmetic and Geometric sequences*. Therefore, the general equation for ALL Arithmetic Sequences is given by *equation a* while the general equation of ALL Geometric Sequences is given by *equation c*. The general equation of a Fibonacci Sequence is given by *equation b*.

**equation A  
Arithmetic Progression**

$$N^{\text{th}} \text{ term} = A + BX$$

**equation B  
Fibonacci Progression**

$$N^{\text{th}} \text{ term} = \frac{1}{\sqrt{5}} \left\{ \left( \frac{1+\sqrt{5}}{2} \right)^x - \left( \frac{1-\sqrt{5}}{2} \right)^x \right\}$$

**equation C  
Geometric Progression**

$$N^{\text{th}} \text{ term} = A + BC^x$$

A *Fibonacci progression* is a special sequence of numbers where the nth term is the sum of the two preceding terms.

*example C*

1, 1, 2, 3, 5, 8, 13

Other known sequences include Lucas Sequence, Harmonic Sequence, Triangular Numbers, Square Numbers, Gnomons, Oblong Numbers, Pentagonal Numbers, and a lot more.

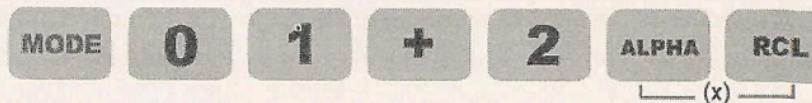
## How to Solve the N<sup>th</sup> term a Progression

*Example 10: Arithmetic Sequence.*  
**Find the 11th term of the arithmetic sequence given below.**

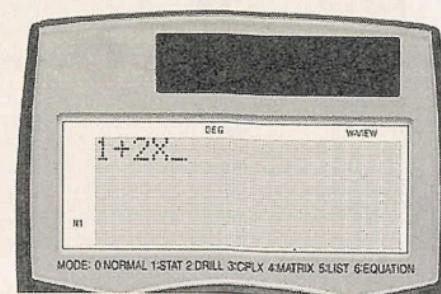
1, 3, 5, 7....

*Solution:*

**Step 1. Make sure calculator is in normal mode. Input the general equation of the sequence. For odd number progression, the general equation is  $1 + 2X$ . Input this in your calculator.**



**Step 2: Solve for the unknown term.**



Notice that in the generated general equation of the sequence, when the value of X is zero, you get an answer that is equal to the first term. Therefore, you can get the value of the 11th term when you substitute 10 as a value of X.

*Example 11: Geometric Sequence.*

Find the 10th term of the geometric sequence

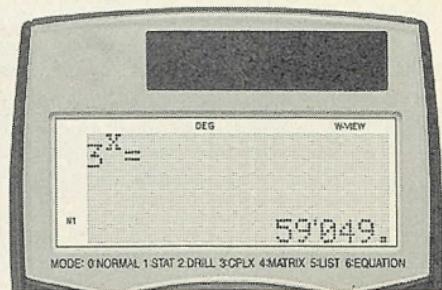
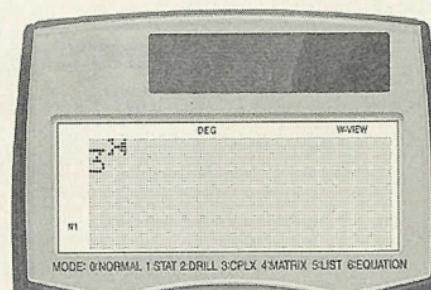
3, 9, 27.....

*Solution:*

**Step 1. Make sure calculator is in normal mode.  
Input the general equation of the sequence in  
your calculator.**



applications in algebra



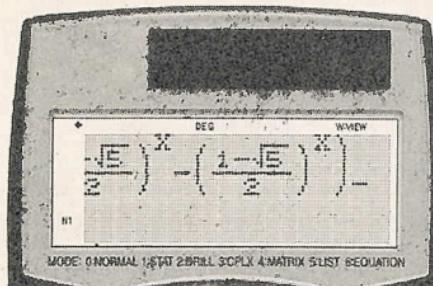
**Step 2: Solve for the unknown term.**



In contrast to the previous problem, in this problem, when you substitute 1 as a value for X, you get the first term. Therefore, to be able to get the value of the 10th term, substitute 10 as a value for X.

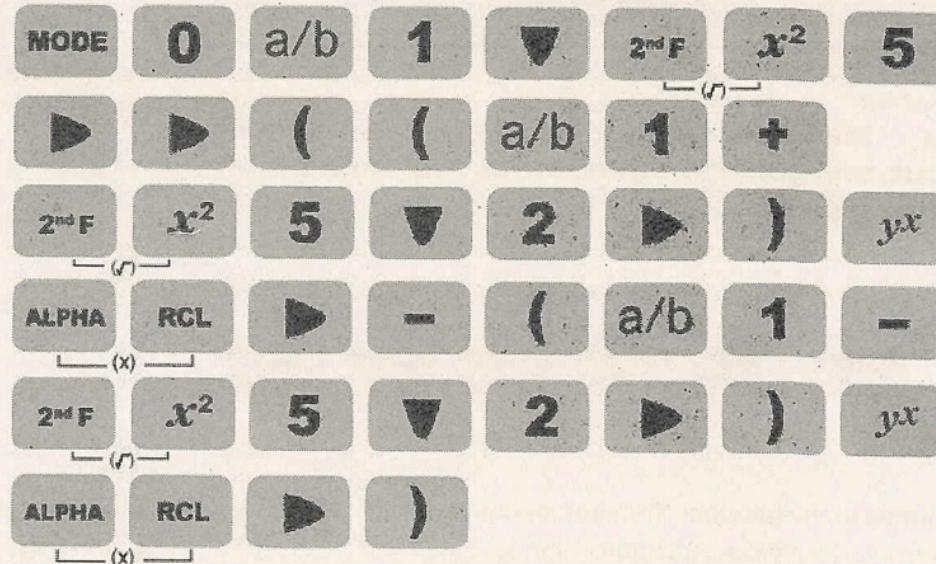
*Example 12: Fibonacci sequence.*  
Find the 21st term of the Fibonacci sequence.

1, 1, 2, 3, 5, 8...

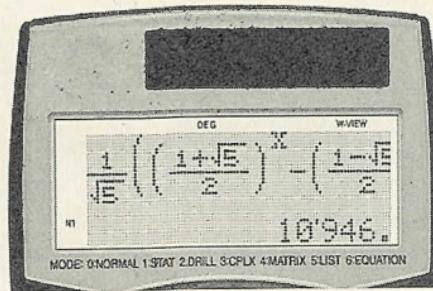


*Solution:*

*Step 1. Make sure calculator is in normal mode. Input the general equation of the sequence in your calculator.*



*Step 2: Solve for the unknown term.*



MATH    1    2    1    =

### Steps in Solving the N<sup>th</sup> term of a Progression

1. Generate the general equation of the sequence using equation A, B or C. Input this in your
2. Simply substitute the correct value for X in order to get the nth term.

### Steps in Solving the Sum of a Progression

1. Generate the general equation of the sequence using equation A, B or C. Input this in your calculator.
2. Solve for the sum using the summation key in your calculator by correctly inputting the initial and final values of x.

1  
the problem



is it?

- A. 2.123
- B. 1.569
- C. 1.163
- D. 6.432

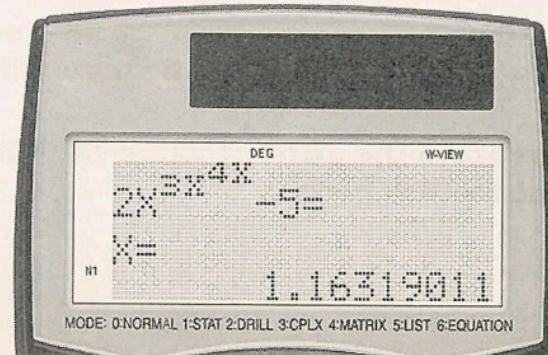
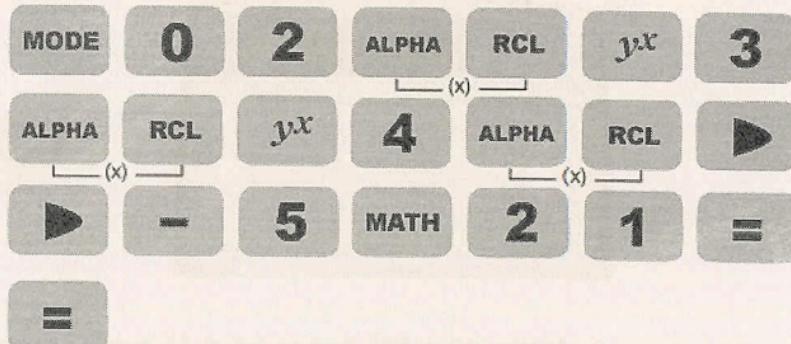
Find the value of x.

$$2x^{3x^{4x}} = 5$$

... and the Answer is!



click This!



the problem

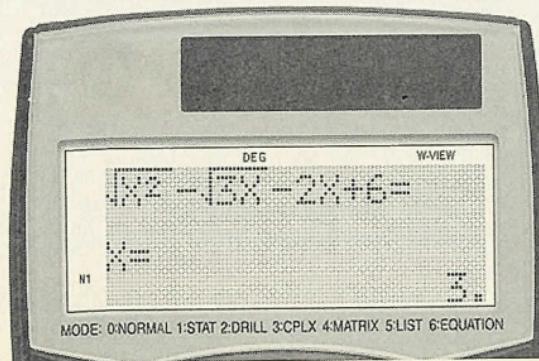


Determine the value of x.

$$\sqrt{x^2} - \sqrt{3x} = 2x - 6$$

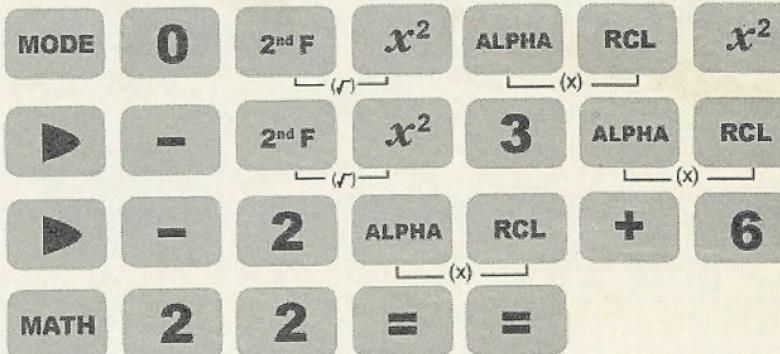
- A. 1
- B. 2
- C. 3
- D. 4

2



applications in algebra

click This!



... and the Answer is!

## applications in algebra

**3**  
the problem



is it?

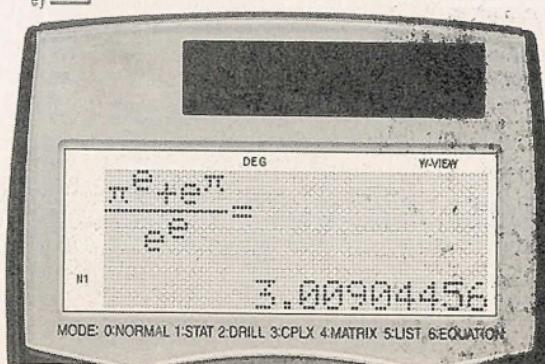
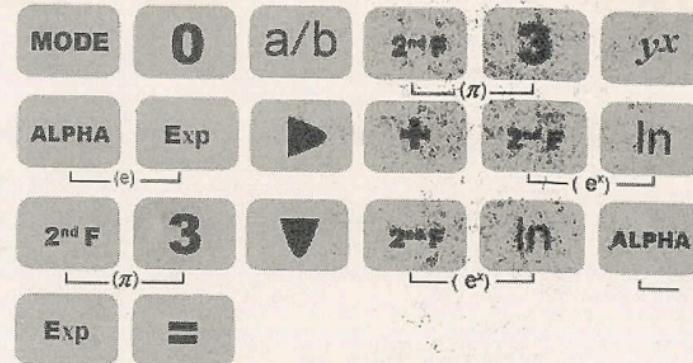
- A. 1
- B. 2
- C. 3
- D. 4

$$\frac{\pi^e + e^\pi}{e^e} = ???$$

... and the Answer is!



click This!



the problem



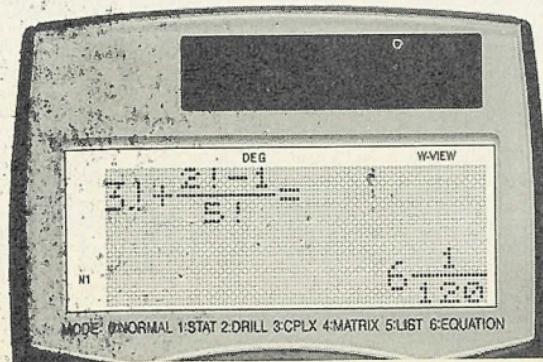
is it?



$$3! + \frac{2! - 1}{5!} = ???$$

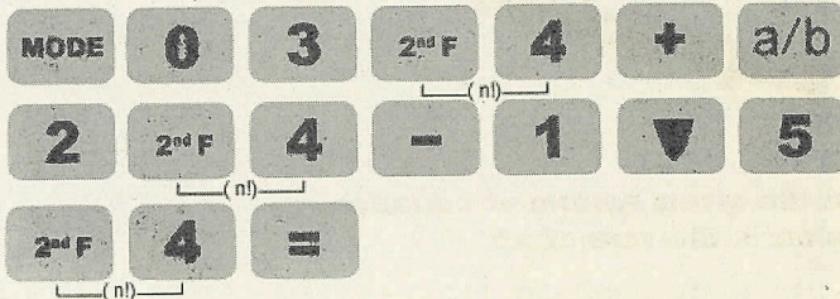
- A. 6
- B. 7
- C. 8
- D. 9

4



applications in algebra

click This!



... and the Answer is!

# 5

the problem

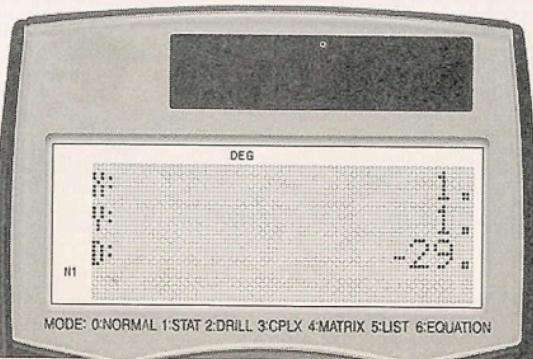


is it?

- A. 1
- B. 2
- C. 3
- D. 4

click This!

MODE	6	0	2	=	5
=	7	=	7	=	3
=	1	0	=		



In the given system of equation,  
what is the value of x?

$$2x + 5y = 7$$

$$7x + 3y = 10$$

...and the Answer is!

the problem



is it?



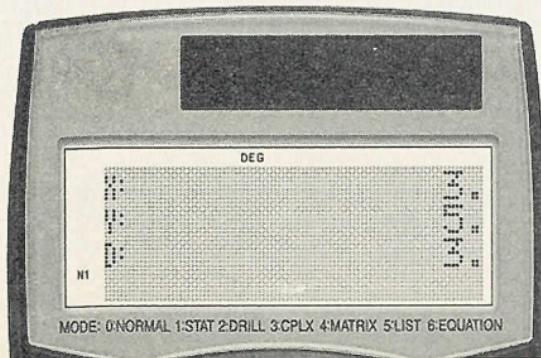
Find the value of  $y$  in the given system of linear equations.

$$x + y = 8$$

$$2x + 5y = 31$$

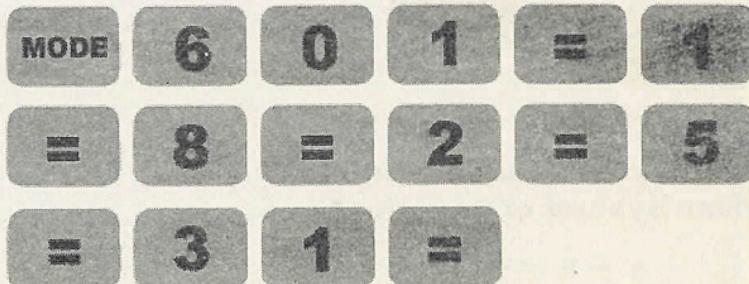
- A. 2
- B. 3
- C. 4
- D. 5

6



applications in algebra

click This!



... and the Answer is!

# 7

*the problem*



is it?

- A. 1
- B. 2
- C. 3
- D. 4

What is the value of z in the given system of equations?

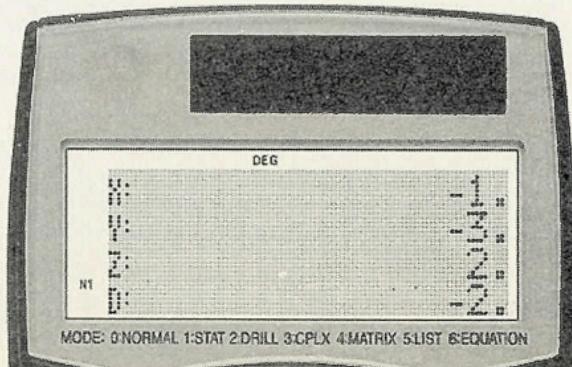
$$x + y = -4$$

$$x + z - 1 = 0$$

$$y + z + 1 = 0$$

click This!

MODE	6	1	1	=	1	=	0
=	(-)	4	=	1	=	0	=
1	=	1	=	0	=	1	=
1	=	(-)	1	=			



... and the Answer is!

the problem



is it?



applications in algebra

click This!

What is the value of x, y, and z in the given system of equations?

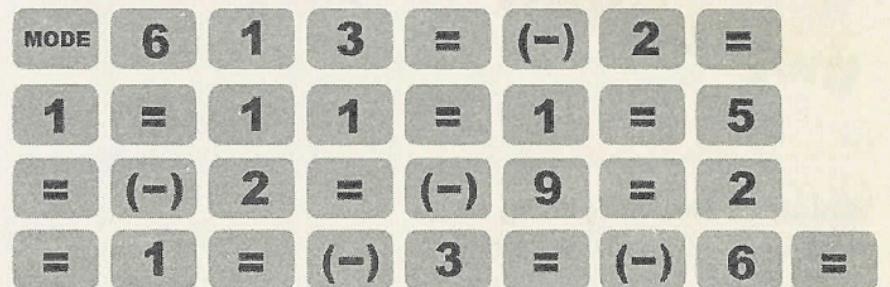
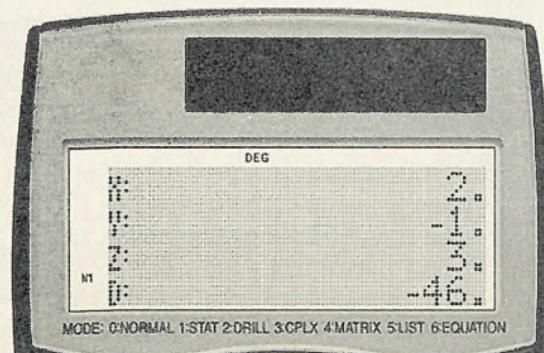
$$3x - 2y + z = 11$$

$$x + 5y - 2z = -9$$

$$2x + y - 3z = -6$$

- A. 1,2,3
- B. -1,2,3
- C. 1,-2,3
- D. 1,2,-3

8



... and the Answer is!

# 9

the problem

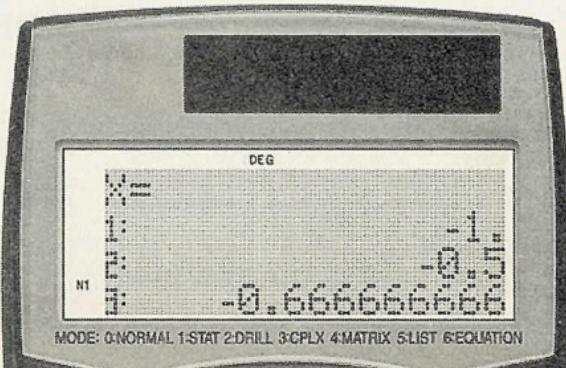


is it?

- A. 1
- B. -1
- C. 2
- D. -2

click This!

MODE    6    3    6    =    1    3  
 =    9    =    2    =



Which of the following is a root of the given equation?

$$6x^3 + 13x^2 + 9x + 2 = 0$$

...and the Answer is!

the problem



is it?

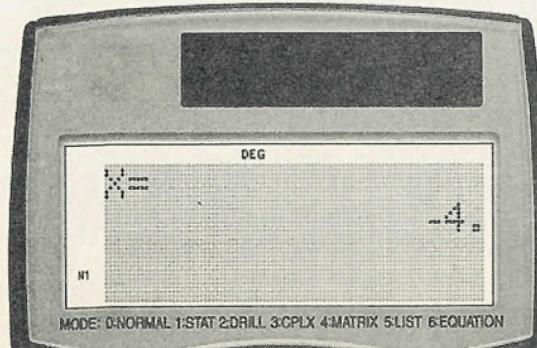


Solve for the value of  $x$  that satisfies the given equation.

$$x^2 + 8x + 16 = 0$$

- A. 2
- B. 3
- C. 4
- D. -4

# 10



applications in algebra

click This!

MODE    6    2    1    =  
8    =    1    6    =

... and the Answer is!

**11**  
the problem



is it?

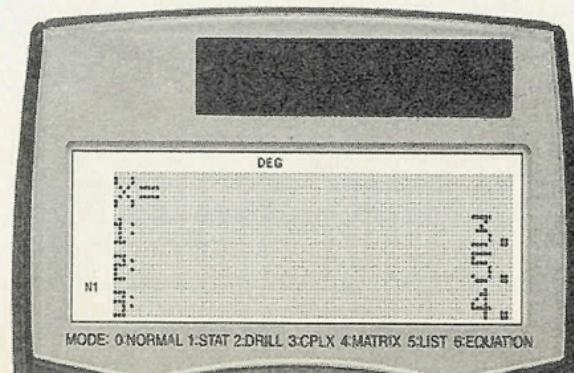
- A. 11
- B. 12
- C. 13
- D. 14

click This!

MODE    6    3    1    =    (-)    1    2  
 =    4    7    =    (-)    6    0

Find the sum of the roots of the given equation.

$$x^3 - 12x^2 + 47x - 60 = 0$$



... and the Answer is!

**the problem**



**is it?**



applications in algebra

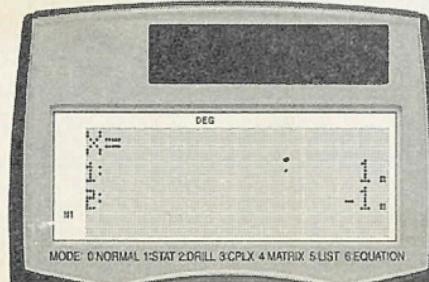
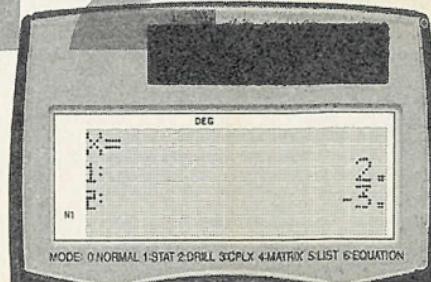
**click This!**

If you add the roots of the given equations, then what is the sum?

$$x^2 + x - 6 = 0$$

$$x^2 - 1 = 0$$

12



- A. 1
- B. -1
- C. 2
- D. -2

MODE    6    2    1    =    1    =

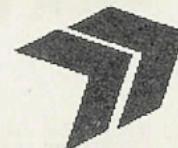
(-)    6    =

MODE    6    2    1    =    0    =

(-)    1    =

... and the Answer is!

**13**  
the problem

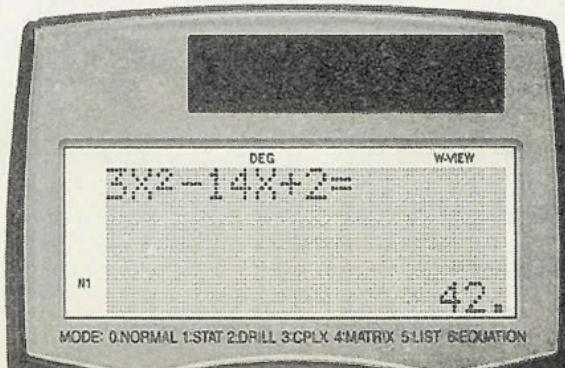
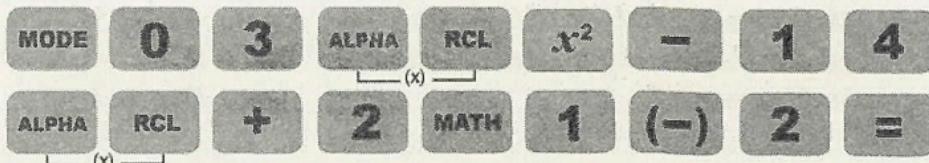


is it?



click This!

- A. 22
- B. 32
- C. 32
- D. 42



Find the remainder if I perform the division of the two given equations.

$$\frac{3x^2 - 14x + 2}{x + 2}$$

... and the Answer is!

the problem



is it?



applications in algebra

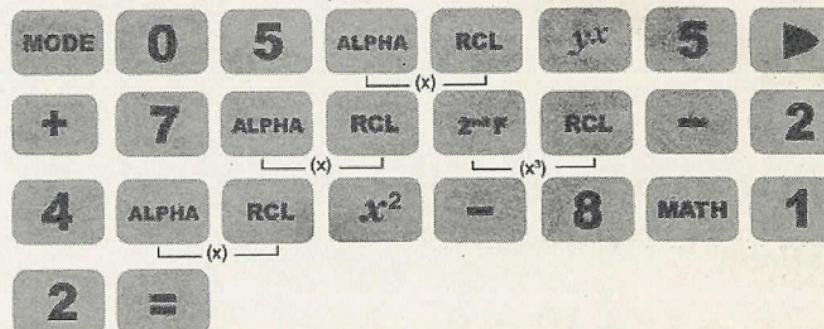
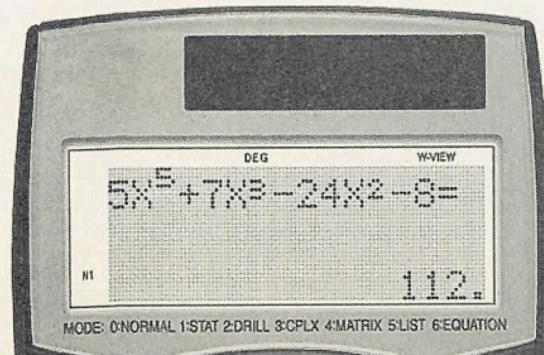
click This!

What is the remainder if the given quintic equation is divided by  $x - 2$ ?

$$5x^5 + 7x^3 - 24x^2 - 8 = 0$$

- A. 111
- B. 112
- C. 113
- D. 114

14



...and the Answer is!

**15**  
the problem

is it?

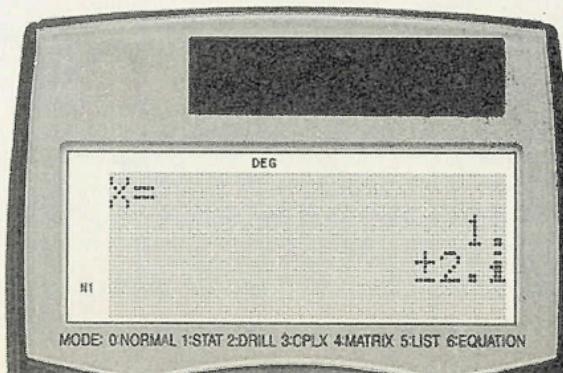
click This!

A.  $2 + 2i$   
 B.  $1 + 2i$   
 C.  $2 + i$   
 D.  $3 + 3i$

MODE    6    2    2    =  
 (-)    4    =    1    0    =

Which of the following choices  
is a root of the given quadratic  
equation?

$$2x^2 - 4x + 10 = 0$$



...and the Answer is!

**the problem**



**is it?**



**applications in algebra**

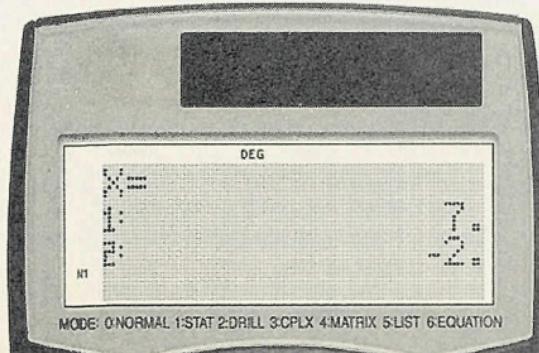
**click This!**

If one root of the given quadratic equation is 7, then what is the other root?

$$2x^2 - 10x - 28 = 0$$

- A. -2
- B. 3
- C. -4
- D. 5

**16**



MODE    6    2    2    =    (-)    1    0  
 =    (-)    2    8    =

**... and the Answer is!**

## applications in algebra

**17**  
the problem



is it?

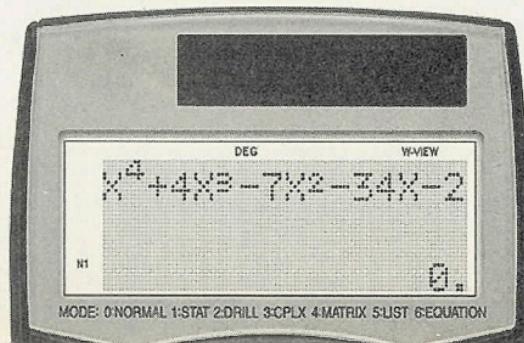
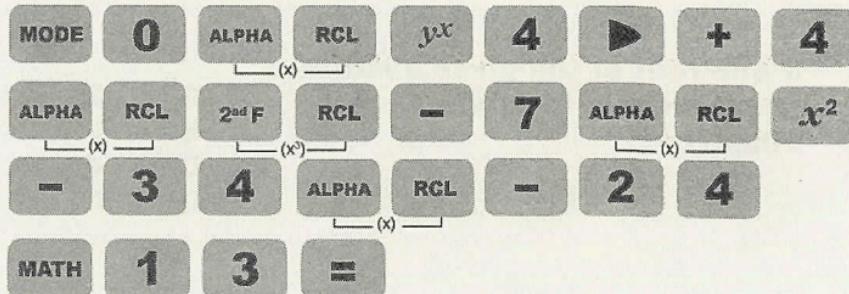
- A. 1
- B. 2
- C. 3
- D. 4

Which of the following is a factor of the given quartic equation?

$$x^4 + 4x^3 - 7x^2 - 34x - 24 = 0$$



click This!



... and the Answer is!

the problem



is it?



applications in algebra

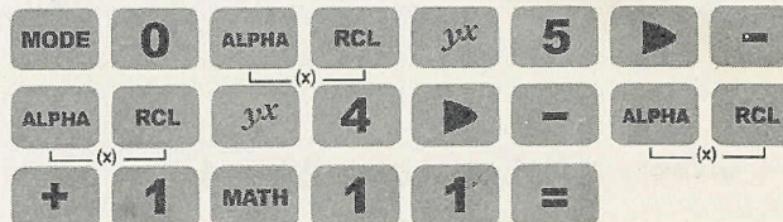
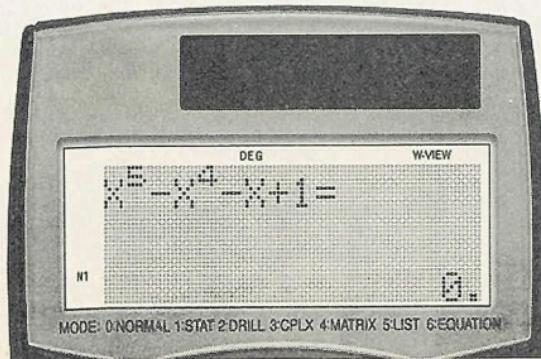
click This!

Which of the following choices  
is a root of the given quintic  
equation?

$$x^5 - x^4 - x + 1 = 0$$

- A. 1
- B. 2
- C. 3
- D. 4

18



... and the Answer is!

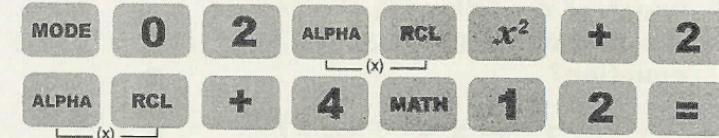
# 19

the problem



is it?

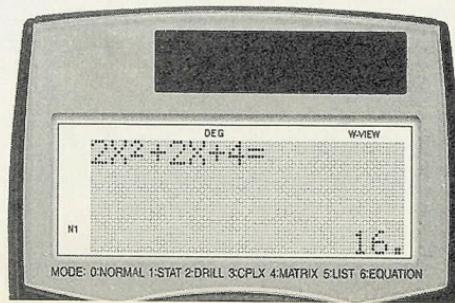
- A. 16
- B. 17
- C. 18
- D. 19



Given:  $f(x) = 2x^2 + 2x + 4$

Find  $f(2)$ .

... and the Answer is!



the problem



is it?

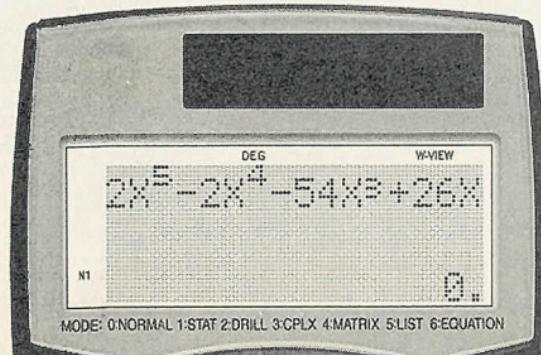


What is the negative root of the given equation?

$$2x^5 - 2x^4 - 54x^3 + 26x^2 + 268x - 240 = 0$$

- A. -2
- B. -4
- C. -1
- D. -5

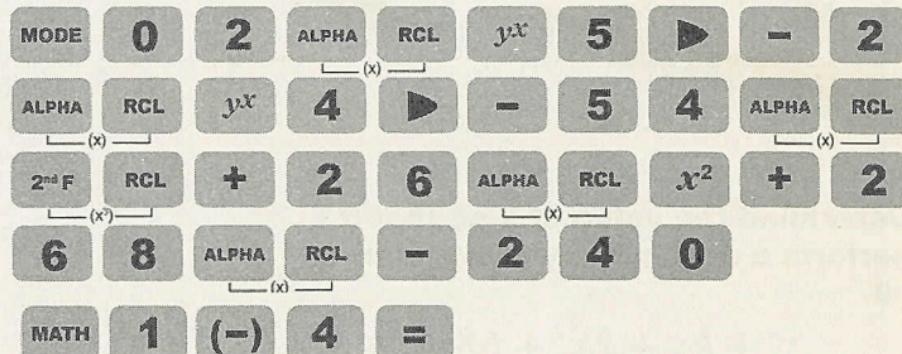
20



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applications in algebra

click This!



... and the Answer is!

21  
the problem

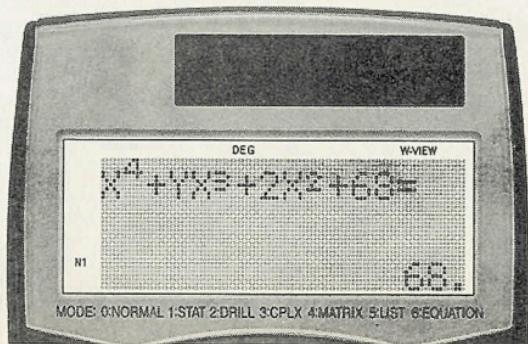
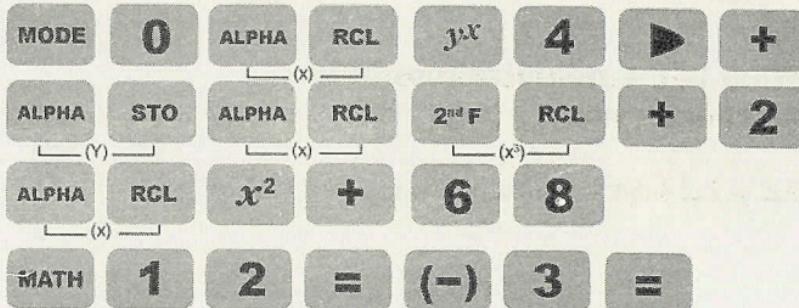
Determine the value of k so that if I perform a division, my remainder is 68.

$$\frac{x^4 + kx + 2x^2 + 68}{x - 2}$$

- A. -1
- B. 2
- C. -3
- D. 4

is it?

click This!



... and the Answer is!

the problem



is it?



applications in algebra

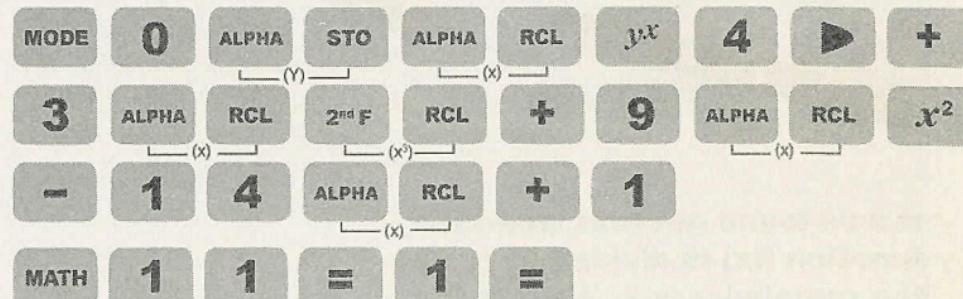
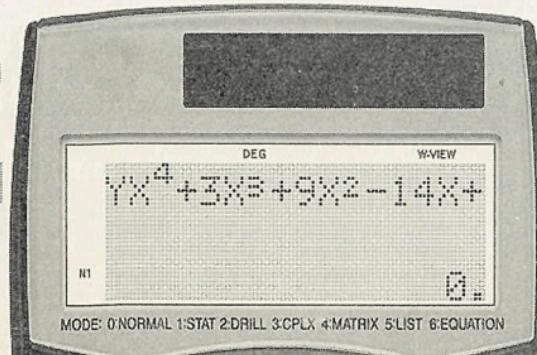
click This!

Find k so that  $x - 1$  is a factor of the given equation.

$$kx^4 + 3x^3 + 9x^2 - 14x + 1 = 0$$

- A. 1
- B. 2
- C. 3
- D. 4

22



... and the Answer is!

## applications in algebra

**23**  
the problem

is it?

- A. 1
- B. 2
- C. 3
- D. 4

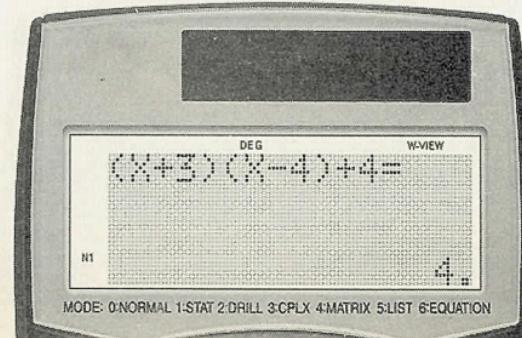
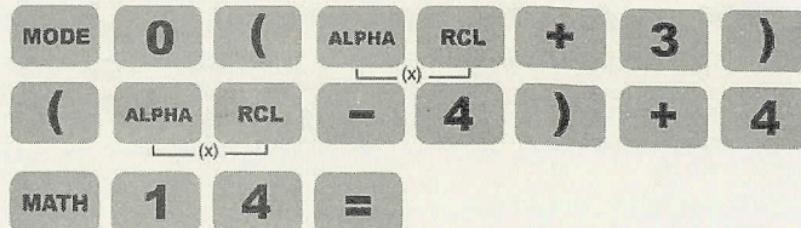
It was found out that when the function  $f(x)$  is divided by  $(x - k)$ , the remainder is  $k$ . What is the value of  $k$ ?

$$f(x) = (x + 3)(x - 4) + 4$$

... and the Answer is!

**click This!**

*Solution:* Choose which among the choices will give zero as an answer when it is substituted in the function  $f(x)$ .



the problem



is it?

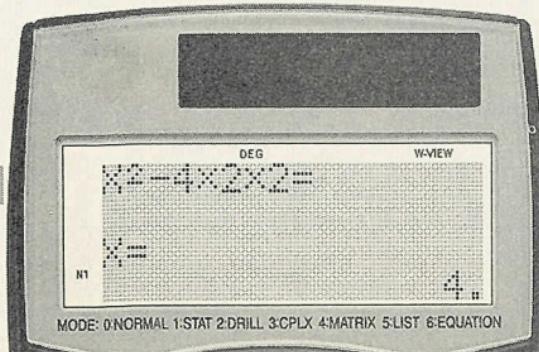


Determine k so that the given equation will have just one real solution.

- A. 1
- B. 2
- C. 3
- D. 4

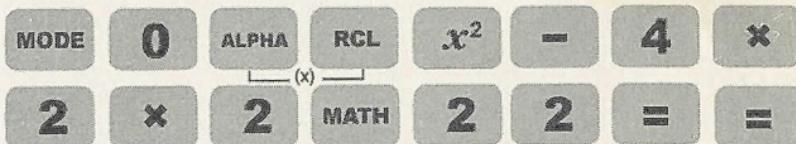
$$2x^2 + kx = -2$$

24



applications in algebra

click This!



... another Answer is!

**25**  
the problem



is it?

- A.  $\frac{30}{6}$
- B.  $\frac{34}{6}$
- C.  $\frac{-35}{6}$
- D.  $\frac{-37}{6}$

Find the value of k so that  $g(x)$  is a factor of  $f(x)$ .

$$f(x) = 3x^2 + kx + 2$$

$$g(x) = 2x - 3$$

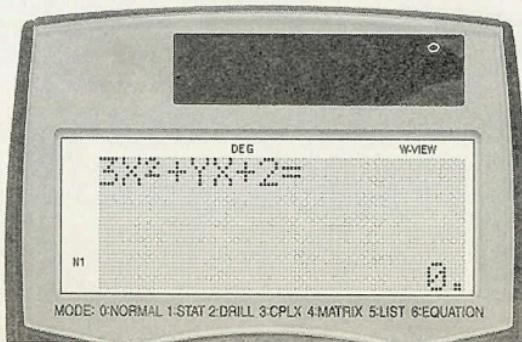
... and the **Answer** is!



**click This!**

*Solution:* Choose which among the choices will give zero as an answer when it is substituted in the function  $f(x)$ .

MODE	0	3	ALPHA	RCL	$x^2$	+
ALPHA	STO	ALPHA	$\frac{(x)}{(y)}$	RCL	+	2
MATH	1	3	a/b	2	=	(-)
3	5	a/b	6	=		



the problem



is it?



applications in algebra

click This!

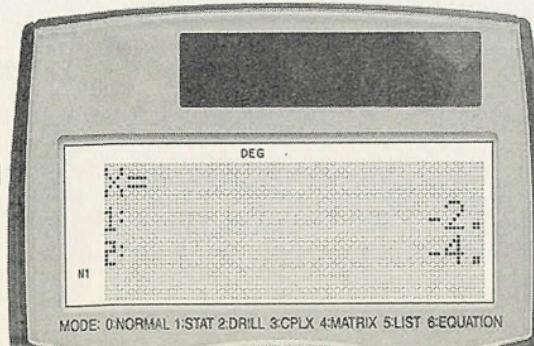
What are the factors of the given expression?

$$x^2 + 6x + 8 = 0$$

- A. 1, 2
- B. 2, 4
- C. -2, -4
- D. -1, -2

MODE    6    2    1    =    6    =    8    =

26



... and the Answer is!

**27**  
the problem



is it?

What are the values of  $x$  in the given equation?

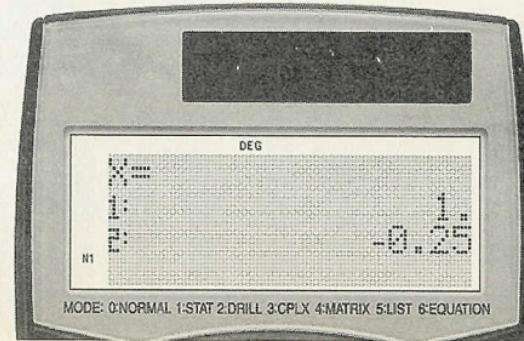
$$12x^2 - 9x - 3 = 0$$

- A. 1, 0.5
- B. 1, -0.5
- C. 1, 0.25
- D. 1, -0.25



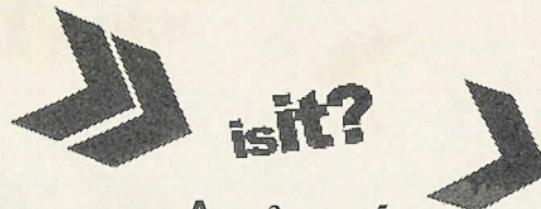
click This!

MODE    6    2    1    2    =    (-)    9  
 =    (-)    3    =



... and the Answer is!

the problem

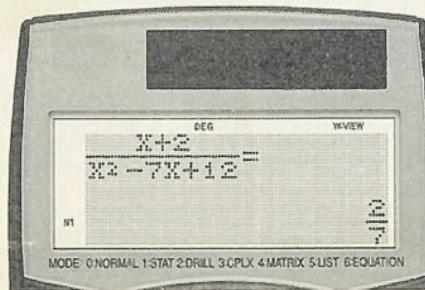
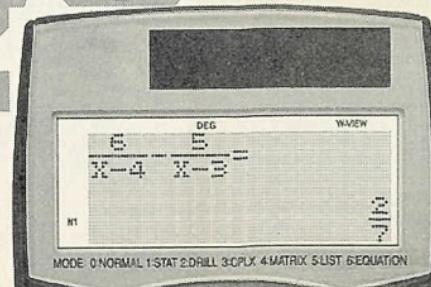


is it?

Resolve into partial fractions.

$$\frac{x+2}{x^2 - 7x + 12}$$

20



applications in algebra

click This!

*Solution:* Apply Calculator Mathematics method  
and use 10 as the value for x.

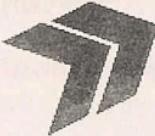
MODE 0 a/b ALPHA RCL + 2 ▼  
ALPHA RCL x^2 - 7 ALPHA RCL +  
- (x) 1 2 MATH 1 1 0 =

a/b 6 ▼ ALPHA RCL - 4  
1 2 MATH 1 1 0 =

a/b 5 ▼ ALPHA RCL - 4  
1 2 MATH 1 1 0 =

. and the Answer is!

**29**  
the problem

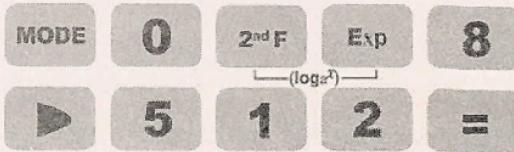


is it?

- A. 1
- B. 2
- C. 3
- D. 4



click This!

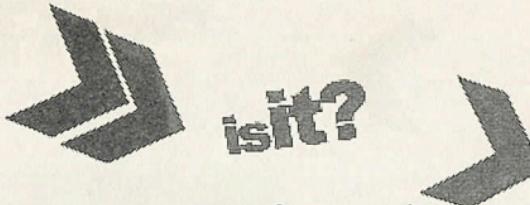


Evaluate the given expression.

$$\log_8 512 = ??$$

... and the Answer is!

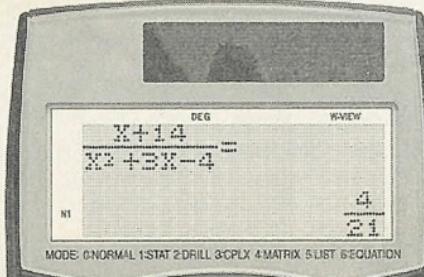
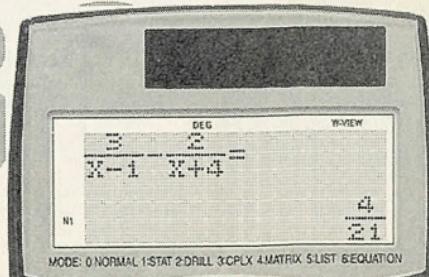
the problem



Resolve into partial fractions.

$$\frac{x+14}{x^2+3x-4}$$

3



A.  $\frac{3}{x-1} - \frac{4}{x+4}$

B.  $\frac{2}{x-1} - \frac{3}{x+4}$

C.  $\frac{3}{x-1} + \frac{2}{x+4}$

D.  $\frac{3}{x-1} - \frac{2}{x+4}$

applications in algebra

click This!

*Solution: Apply Calculator Mathematics method and use 10 as the value for x.*

MODE    0    a/b    ALPHA    RCL    +    1    4    ▼  
 ALPHA    RCL    x<sup>2</sup>    +    3    ALPHA    RCL    -    4  
 MATH    1    1    0    =

a/b    3    ▼    ALPHA    RCL    -    1    ▶    -  
 a/b    2    ▼    ALPHA    RCL    +    4    MATH    1  
 1    0    =

... and the Answer is!

**31**  
the problem



is it?

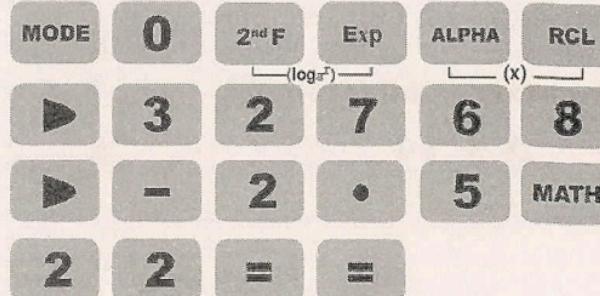
Find the value of  $x$  in the given expression.

$$\log_x 32768 = 2.5$$

... and the **Answer** is!

- A. 54
- B. 64
- C. 65
- D. 70

click This!



the problem

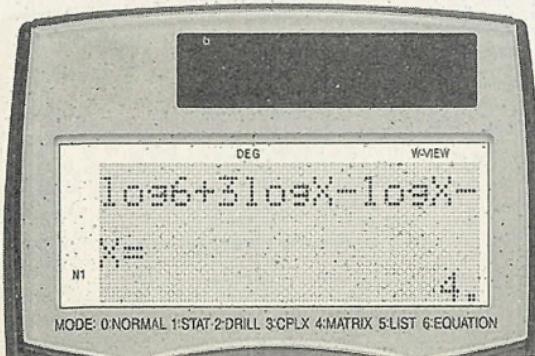
is it?

Find the value of  $x$  in the given expression.

- A. 1
- B. 2
- C. 3
- D. 4

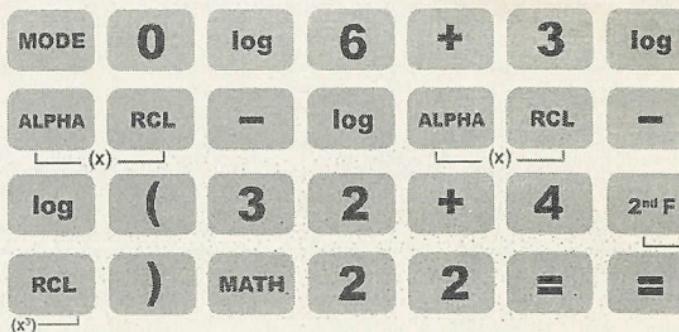
$$\log 6 + 3 \log x = \log x + \log(32 + 4^3)$$

32



applications in algebra

click This!



...and the Answer is!

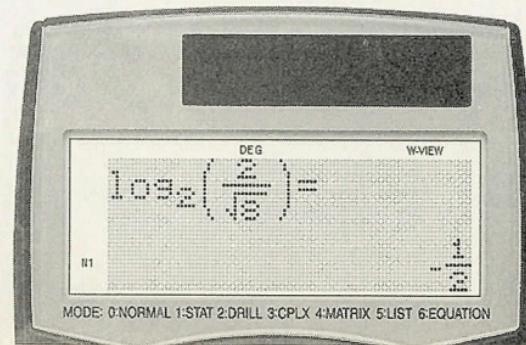
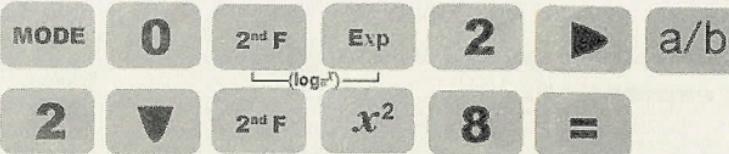
**33**  
the problem



is it?

Solve:  $\log_2 \frac{2}{\sqrt{8}} = ???$

- A. 1
- B. -0.5
- C. 2
- D. 3.5



... and the Answer is!

click This!

the problem



is it?



applications in algebra

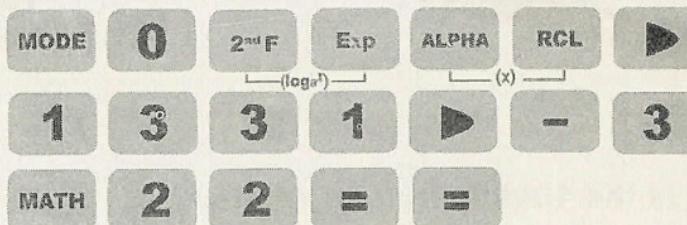
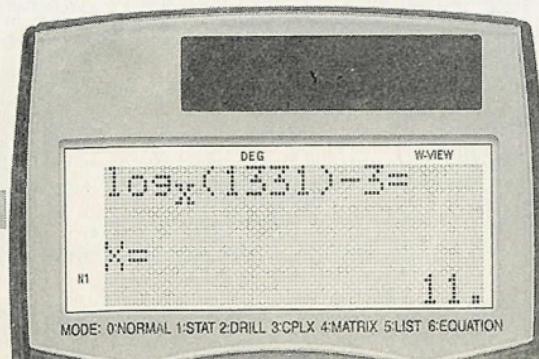
click This!

Solve for  $x$ :

$$\log_x 1331 = 3$$

- A. 10
- B. 11
- C. 13
- D. 15

34



... and the Answer is!

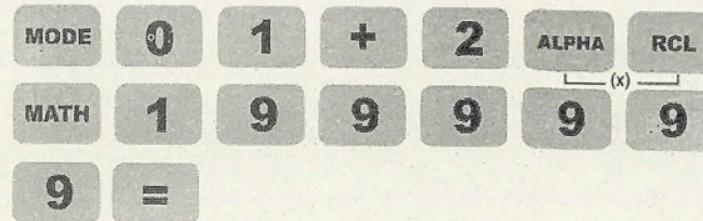
**35**  
the problem



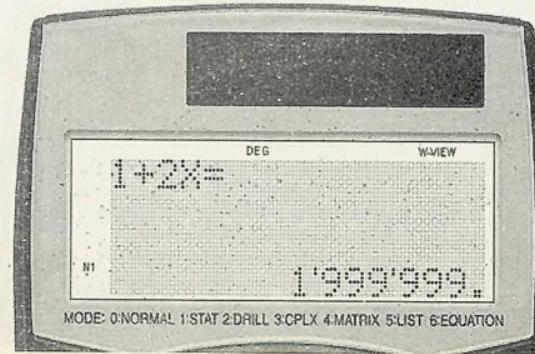
is it?

- A. 1000000
- B. 2000001
- C. 1999999
- D. 2000003

click This!



What is the 1000000th odd number?



... and the Answer is!

the problem  
is it?

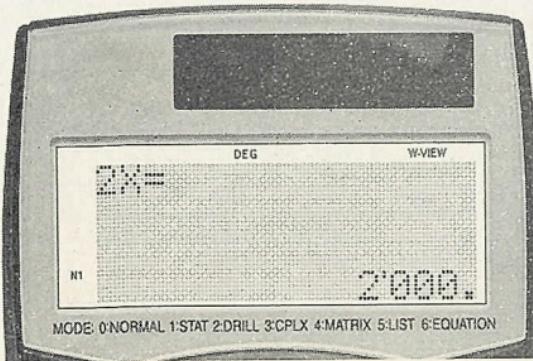
is it?



**What is the 1000th even number?**

- A. 1998
- B. 2000
- C. 2002
- D. 2004

36



click This!

applications in algebra

MODE	0	2	ALPHA	RCL
MATH	1	1	$\frac{1}{(x)}$	0
	0	0		0
	=			

... another Answer is!

**37**  
the problem

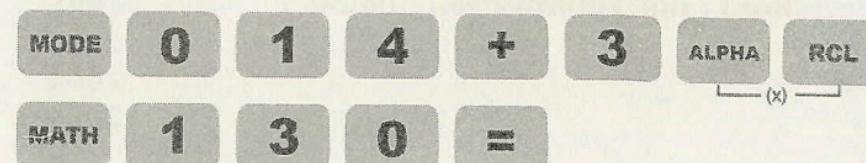


is it?



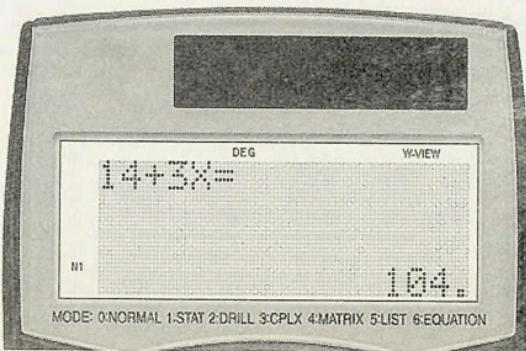
click This!

- A. 101
- B. 102
- C. 103
- D. 104



Find the 30th term of the arithmetic progression

17, 20, 23, ...



... and the Answer is!

the problem



is it?

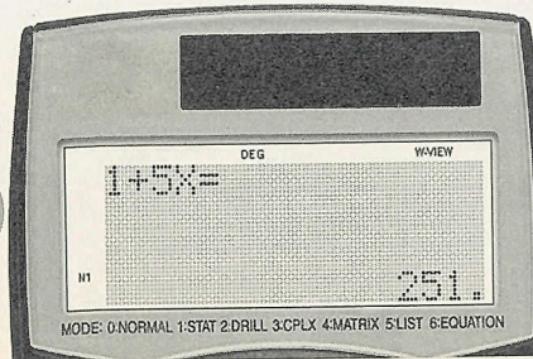


What is the 50th term of the given sequence?

6, 11, 16, . . .

- A. 251
- B. 256
- C. 246
- D. 241

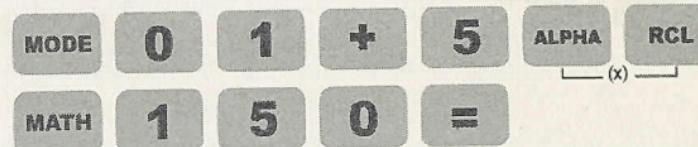
# 38



...and the **Answer** is!

applications in algebra

**click This!**



**39**  
the problem



is it?

- A.  $\frac{1}{32}$
- B.  $\frac{1}{64}$
- C.  $\frac{1}{128}$
- D.  $\frac{1}{16}$

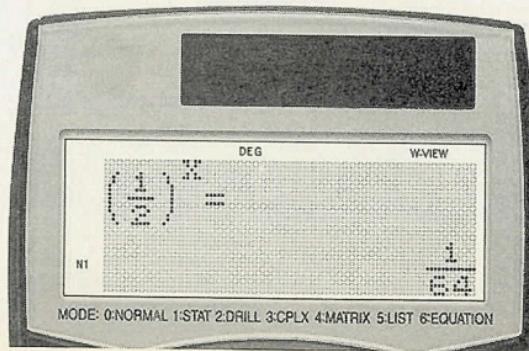
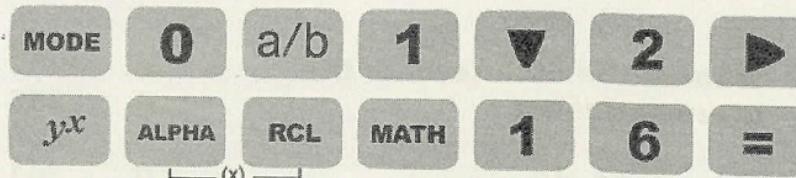
What is the 7th term of the given progression?

$1, \frac{1}{2}, \frac{1}{4}, \dots$

... and the **Answer** is!



click This!



the problem



is it?

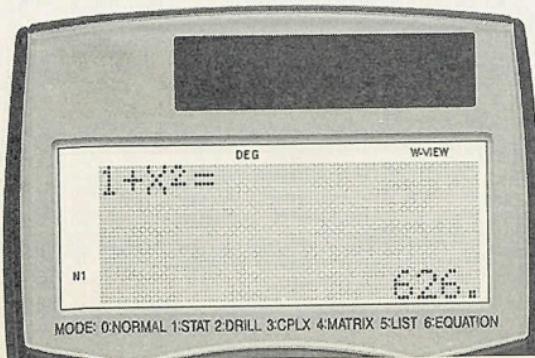


What is the 25th term of the given progression?

2, 5, 10, 17, ...

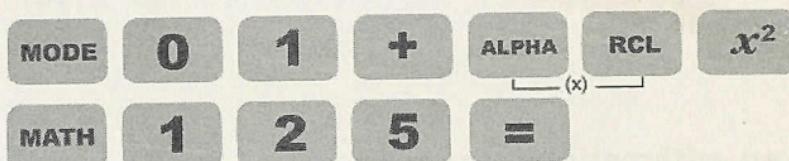
- A. 677
- B. 626
- C. 577
- D. 730

40



...and the Answer is!

applications in algebra  
click This!



41  
the problem

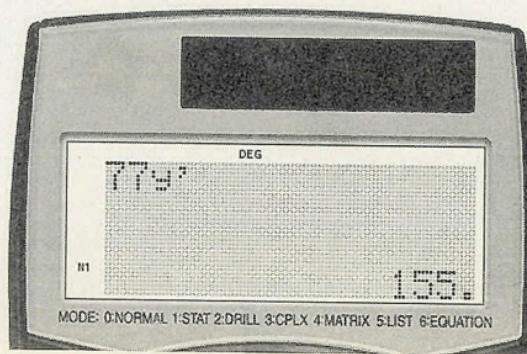
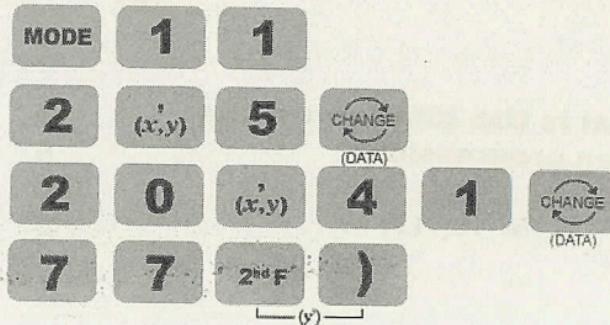


is it?

- A. 153
- B. 155
- C. 157
- D. 159

In an arithmetic progression,  
the 2nd term is 5 and the 20th  
term is 41. Find the 77th term  
of the progression.

click This!



... and the Answer is!

**the problem**



**is it?**



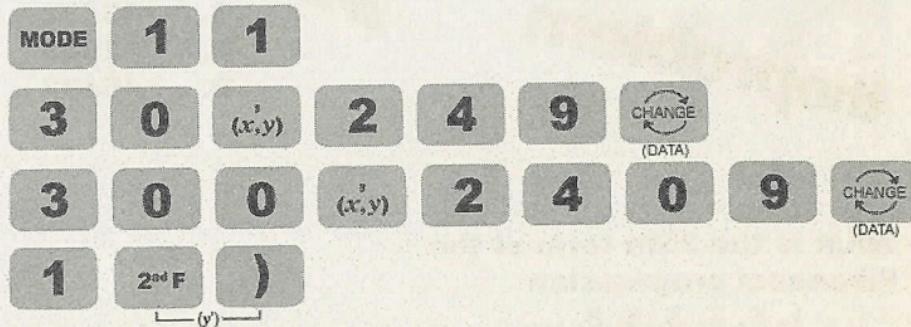
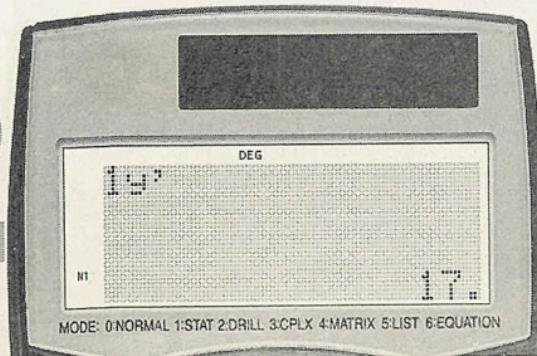
**applications in algebra**

**click This!**

The 30th term of an arithmetic progression is 249 and the 300th term is 2409. What is the first term?

- A. 25
- B. 9
- C. 17
- D. 33

**42**



**...and the Answer is!**

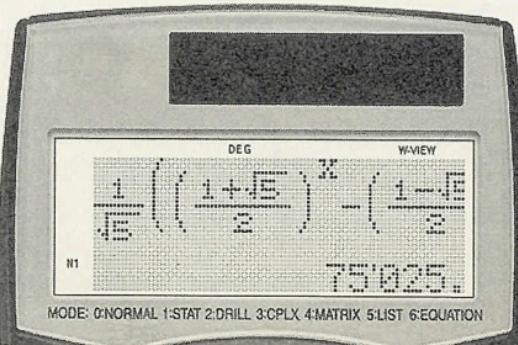
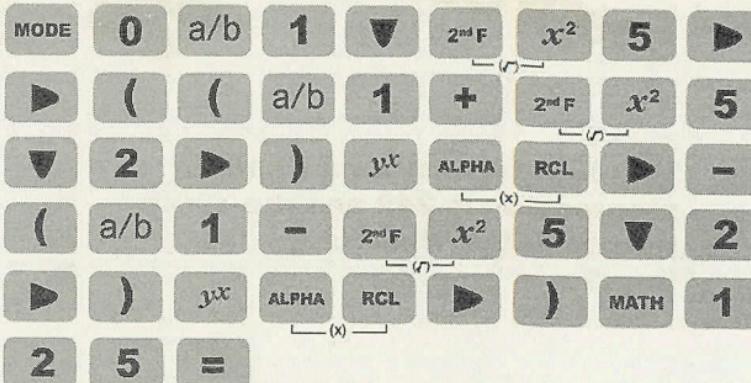
**43**  
the problem



is it?

- A. 75025
- B. 43532
- C. 12345
- D. 45432

click This!



What is the 25th term of the  
Fibonacci progression  
1, 1, 2, 3, 5, 8, ....

... and the Answer is!

the problem



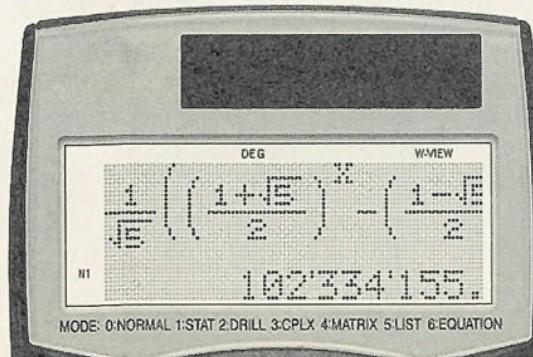
is it?



What is the 40th term of the  
Fibonacci progression  
1, 1, 2, 3, 5, 8, ....

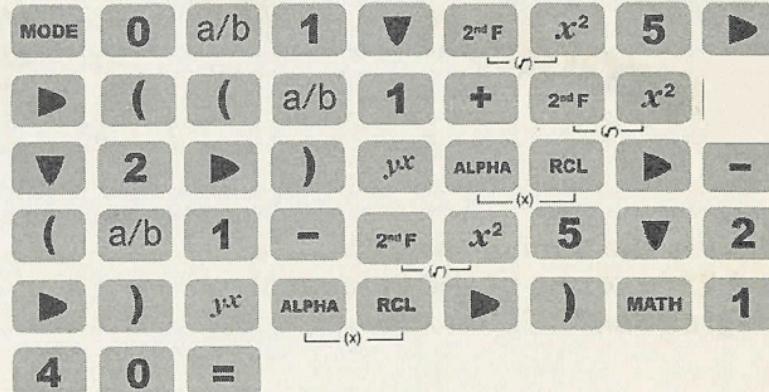
- A. 102,334,155
- B. 433,432,352
- C. 143,342,467
- D. 451,342,567

44



applications in algebra

click This!



... and the Answer is!

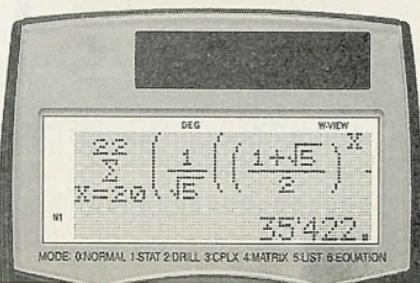
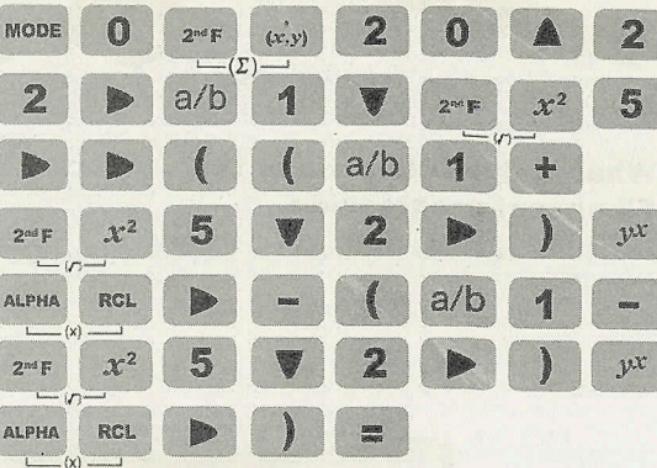
**45**  
the problem

is it?

What is the sum of the 20th, 21st, and 22nd terms of the Fibonacci progression?

- A. 35,422
- B. 44,622
- C. 23,456
- D. 37,543

click This!



... and the Answer is!

In Mathematics, the concept of limit is to describe the behavior of a function as it “gets close” to some point. This was developed in the 18th to 19th century as a means of putting the differential and integral calculus on a rigorous foundation, and still remains as one of the most important concepts. The classic example is a polygon inscribed in a circle. As you increase the number of sides of the n-gon, the n-gon is getting closer and closer to becoming the circle. However, the n-gon never really gets to be the circle, but it will get so close that in fact, for practical purposes, it may as well be considered as the circle.

## How to Solve Limits?

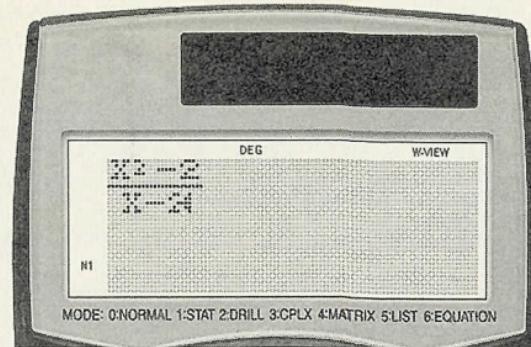
The proper way of solving limits using a calculator follows the concept of “limits” itself, that is, getting close but never really approaches. To do this in your calculator is to substitute a value that is very close to the limit given in the function. Study Example 1.

### *Example 1: Limits*

Evaluate the given limit.

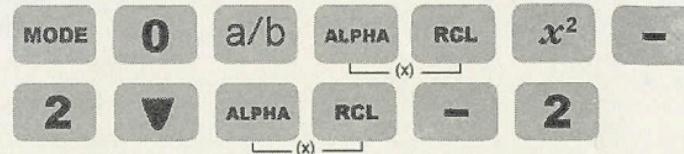
$$\lim_{x \rightarrow 2} \frac{x^2 - 2}{x - 2}$$

A. infinity	C. one
B. zero	D. two

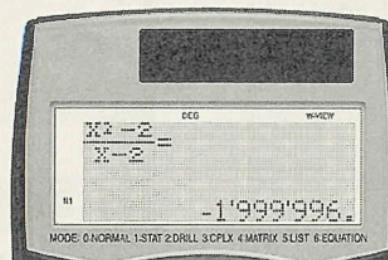


### *Solution:*

**Step 1. Make sure calculator is in NORMAL mode. Enter equation.**



**Step 2.** Substitute the number that approaches the limit and arithmetically solve for the answer.



MATH    1    1    •    9    9  
9    9    9    9    =



MATH    1    2    •    0    0    0  
0    0    1    =

In example 1, if you substitute 1.999999 as a value for x, you get an answer that is negative. On the other hand, if you substitute 2.000001 as a value for x, you get a positive value. As you add more 9 or more 0, the value that you will get will be greater for 2.000001 and lesser for 1.999999. Therefore, you are approaching positive and negative infinity that is why the answer is infinity.

## How to Solve the Derivative of an Exact Function?

Getting the derivative of a function with an exact value for  $x$  is another feature of SHARP EL-W506. You just have to follow the proper format and your calculator will give the correct answer. To do this, you need to press the DERIVATIVE key and correctly input the entire equation. Make sure that before you make any calculation, your calculator must already be in the correct MODE (DEG or RAD). Pressing the equal sign after correctly inputting the entire equation with the corresponding value for  $x$  will generate the correct answer.

### *Example 2: Exact Derivative*

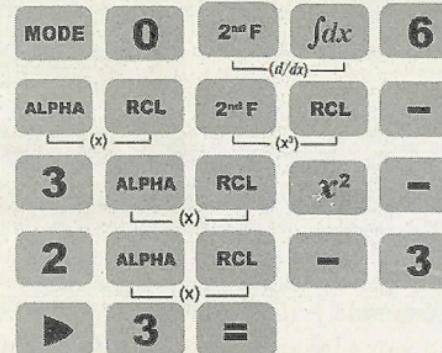
Given the function  $f(x)$ , what the derivative when  $x$  is 3?

$$f(x) = 6x^3 - 3x^2 - 2x - 3$$

A. 144	C. 142
B. 212	D. 150

### *Solution:*

**Make sure calculator is in NORMAL mode. Input the entire function in your calculator using the derivative key and solve for the answer**



The correct answer is letter C

## How to Solve the Derivative of an Inexact Function?

The derivative key in your calculator is capable of solving the first derivative of an exact function. Meaning, the value of  $x$  should be specified. In many occasions however, inexact differentiation is also present. You are required to solve for the first derivative of a function and give the answer as a function of  $x$ .

There is no calculator capable of directly solving inexact differentiation. The only way your calculator can solve inexact differentiation is when the problem is a multiple choice question. The choices will be very useful in finding the correct answer.

The steps in doing inexact differentiation can be summarized by the "Calculator Math Procedure".

### *Calculator Math Procedure*

1. Get an arbitrary constant. The arbitrary constant must not make the denominator zero (if the function is in the form of a fraction) in the main equation and in any of the choices when substituted.
2. Take note of the answer of the main equation.
3. Substitute the arbitrary constant in the choices and take note of the answer for each choice.
4. Compare the answer of the main equation to the answer of the choices. The choice that will give the similar answer is the correct choice.

### Example 3: Inexact Derivative

**Find the derivative of the function  $y$ .**

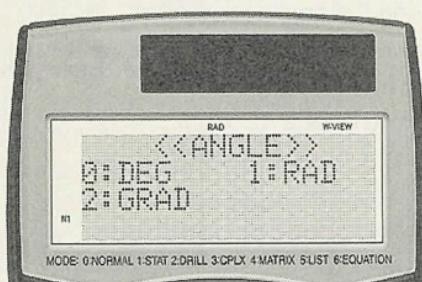
$$y = 4\cos(6 + x^2)$$

- A.  $-8x\sin(6+x^2)$
- B.  $x + \csc x$
- C.  $\cos x + \sec x$
- D.  $x(\sin x + \cos x)$

*Solution:*

*Step 1. Make sure calculator is in the NORMAL mode. Go to radian mode and Input the equation in the calculator.*

*Step 2. Solve for the derivative using 2 as the arbitrary constant. Record the answer.*

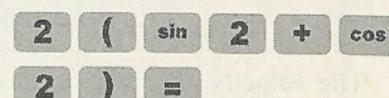
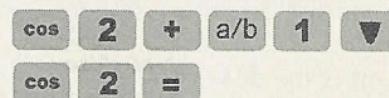
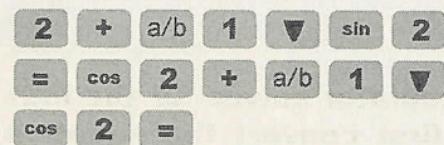
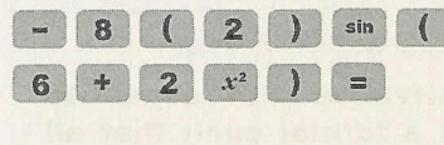
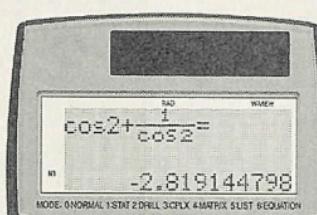
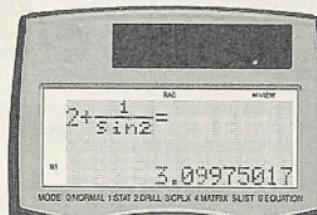
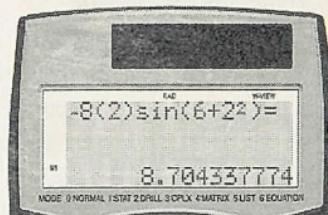


**MODE** **0** **2<sup>nd</sup> F** **MATH** **0** **1**

2 <sup>nd</sup> F	$\int dx$	4	COS	(	6	+
$\frac{d}{dx}$						
ALPHA	RCL	$x^2$	)	▶	2	=

**Step 3.** Substitute the arbitrary constant in the given choices.

applications in differential calculus



Therefore, the answer is letter A

## Applications of the First Derivative

The slope of a curve, velocity, and acceleration of a body can all be solved by getting the derivative of a function.

$$\text{slope} = \frac{dy}{dx}$$

$$\text{velocity} = \frac{ds}{dt}$$

$$\text{acceleration} = \frac{dv}{dt}$$

The velocity of a body at any instant is the derivative of the equation of the distance (S) while the acceleration of a body at any instant is the derivative of the equation of the velocity (V). The slope of a curve is the derivative of the function f(x).

### Example 4: Slope of a Curve

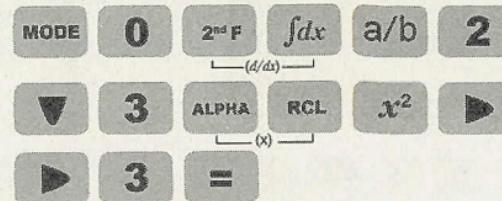
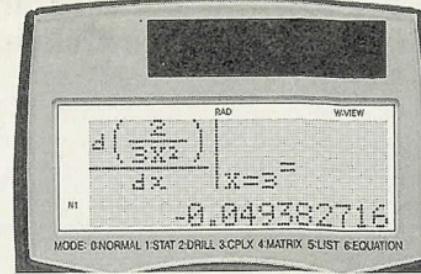
Find the slope of the given function at point (3,10).

$$3x^2y = 2$$

- A. -0.0494
- C. -1.0456
- B. -2.0485
- D. 1.2356

*Solution:*

Since the calculator solves for the first derivative with respect to x, you must first convert the equation in a format such that all functions with x are positioned in the right part of the equation leaving only y on the left part. Make sure calculator is in NORMAL mode and solve for the correct answer using the derivative key



## Applications in Parametric Equations

Parametric equations are a set of equations that express a set of quantities as explicit functions of a number of independent variables, known as "parameters." To understand this, Think of a curve being traced out over time, sometimes doubling back on itself or crossing itself. Such a curve cannot be described by a function  $y = f(x)$ . Instead, we will describe our position along the curve at time  $t$  by

$$\begin{aligned}x &= x(t) \\y &= y(t)\end{aligned}$$

The  $x$  and  $y$  are related to each other through their dependence on the parameter  $t$ . The two given equations are called parametric equations.

**Example 5: Parametric Equations**  
 A circle is represented by its parametric equations  $x = 4\sin(t)$  and  $y = 5\cos(t)$ . Find the slope of its normal at  $t = \pi/4$ .

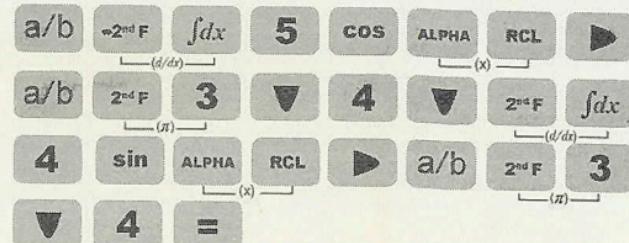
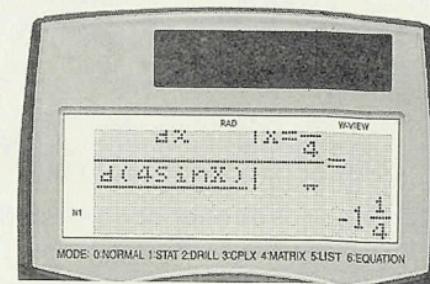
- A.  $\frac{1}{2}$
- B.  $\frac{2}{3}$
- C. -2
- D.  $-\frac{5}{4}$

**Solution:**

**Step 1.** Make sure calculator is in the NORMAL mode. Go to radian mode and input the equation in the calculator.



**Step 2.** Solve for the unknown slope using the correct formula.



the problem



is it?



applications in differential calculus

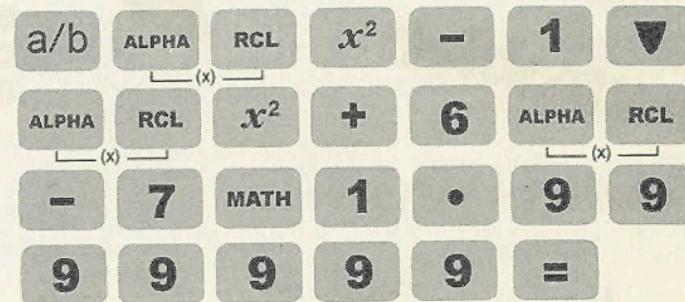
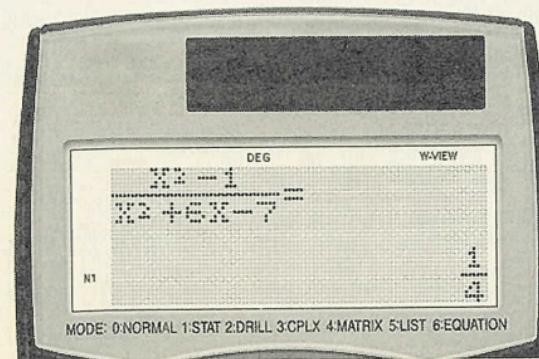
click This!

Find the limit of the function as  $x$  approaches 1.

$$\frac{x^2 - 1}{x^2 + 6x - 7}$$

- A. 0.25
- B. 0.50
- C. 0.75
- D. 1.0

1



... and the Answer is!

# 2

*the problem*



is it?

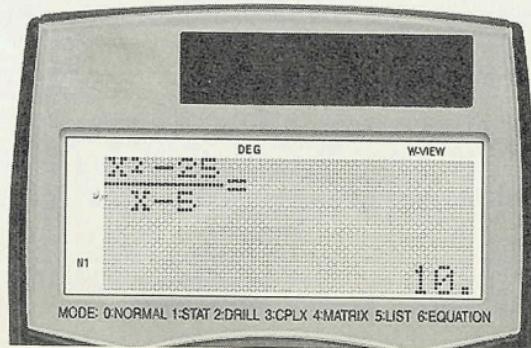
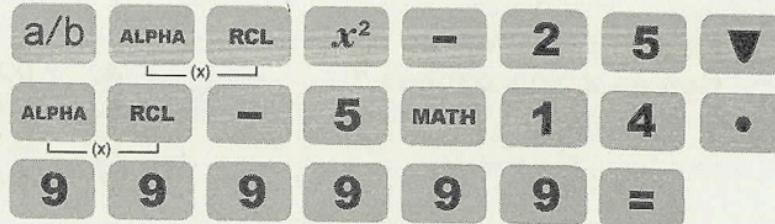


click This!

- A. 5
- B. 10
- C. 15
- D. 20

Simplify the limit given:

$$\lim_{x \rightarrow 5} \frac{x^2 - 25}{x - 5}$$



... and the Answer is!

the problem



is it?



applications in differential  
calculus

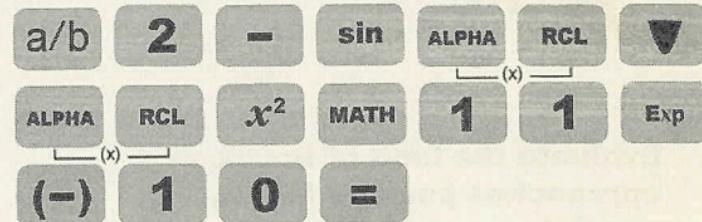
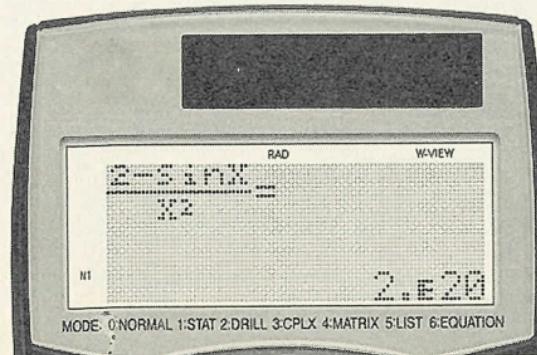
click This!

Evaluate:

$$\lim_{x \rightarrow 0} \frac{2 - \sin x}{x^2}$$

- A. Zero
- B. One
- C. Infinity
- D. Undefined

3



...and the Answer is!

# 4

the problem

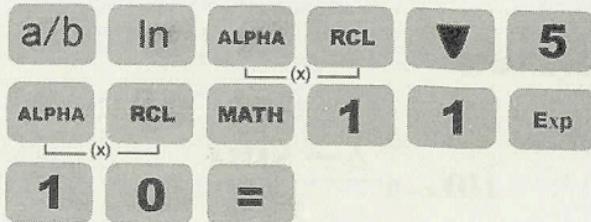


is it?



click This!

- A. Zero
- B. One
- C. Infinity
- D. Undefined



Evaluate the limit of  $\ln x / 5x$  as  $x$  approaches positive infinity.



... and the Answer is!

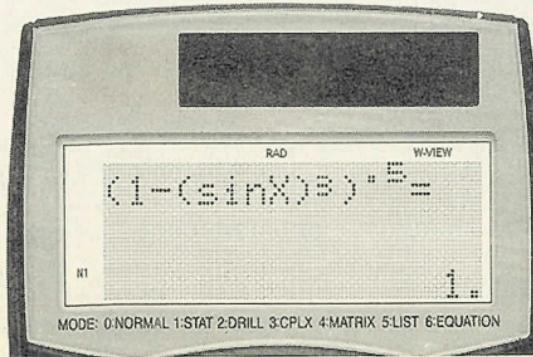
the problem  
is it?

Evaluate the given limit  
as  $x$  approaches zero.

$$\lim_{x \rightarrow 0} (1 - \sin^3 x)^{0.5}$$

- A. Zero
- B. One
- C. Infinity
- D. Undefined

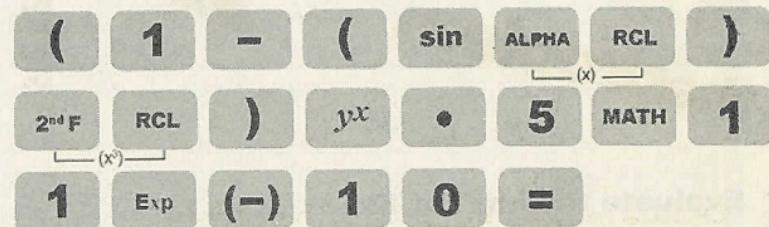
5



... and the Answer is!

applications in differential calculus

click This!



... and the Answer is!

# 6

the problem

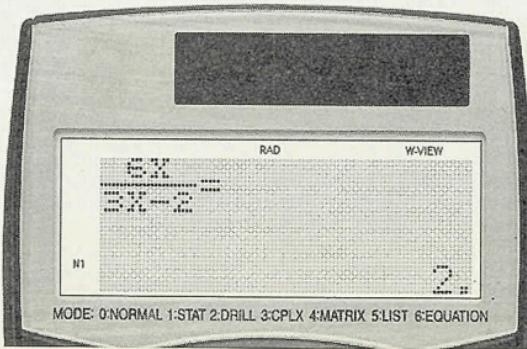
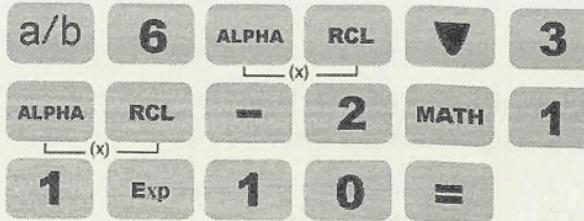


is it?

- A. 1
- B. 2
- C. 3
- D. 4

Evaluate the limit of  $6x/(3x-2)$  as  $x$  approaches positive  $\infty$ .

click This!



... and the Answer is!

the problem



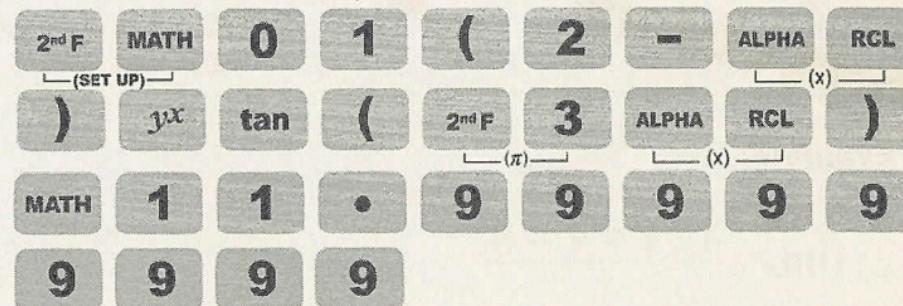
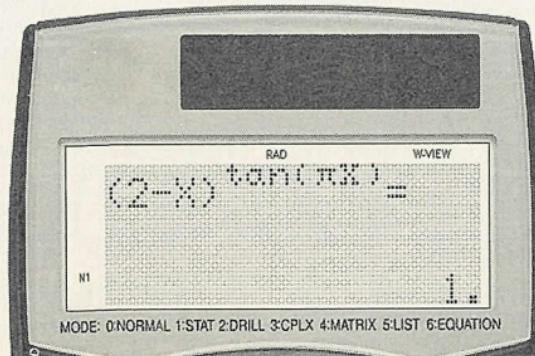
is it?

Evaluate:

$$\lim_{x \rightarrow 2} (2 - x)^{\tan \pi x}$$

- A. 0
- B. 1
- C. 2
- D. 3

7



applications in differential calculus

click This!

... and the Answer is!

8  
the problem



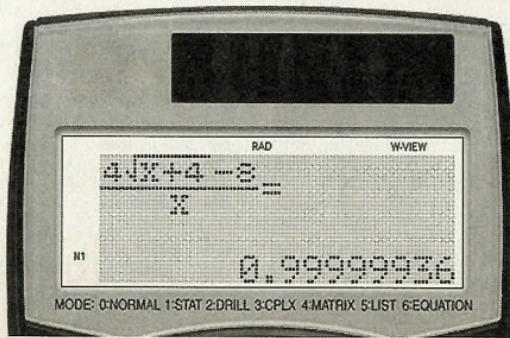
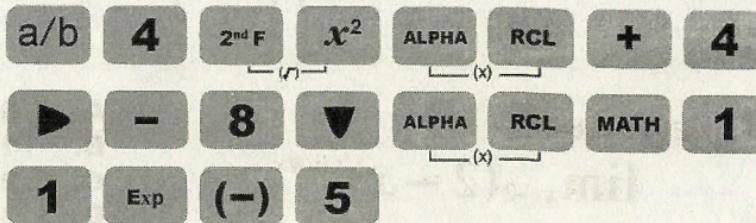
is it?

- A. 1
- B. 2
- C. 3
- D. 4

Evaluate:

$$\lim_{x \rightarrow 0} \frac{4\sqrt{x+4} - 8}{x}$$

click This!



... and the Answer is!

the problem



is it?

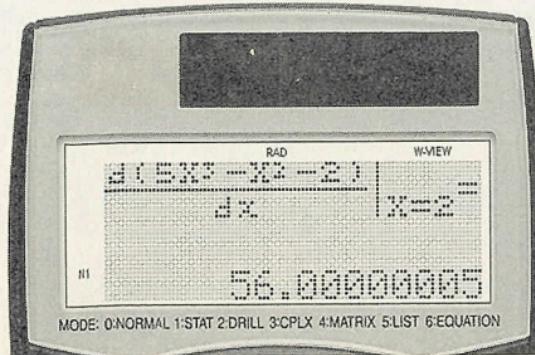


Find the first derivative of the function when  $x = 2$ .

$$f(x) = 5x^3 - x^2 - 2$$

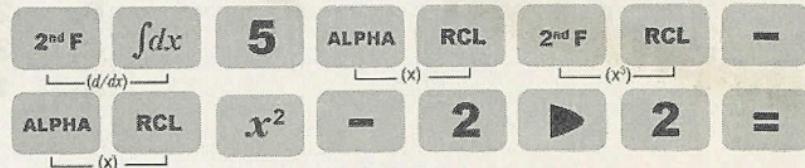
- A. 52
- B. 54
- C. 56
- D. 58

9



applications in differential calculus

click This!



...and the Answer is!

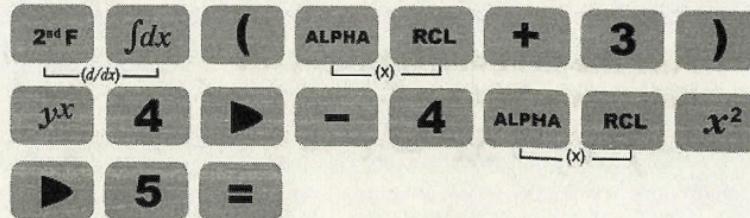
**10**  
the problem



is it?

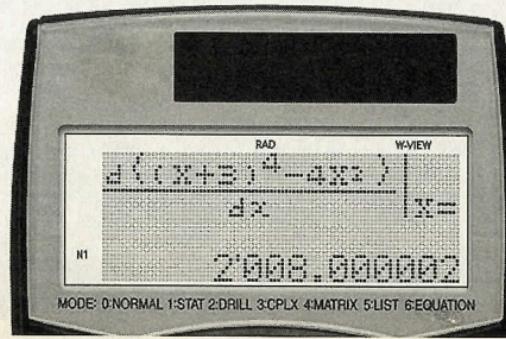
- A. 2008
- B. 2010
- C. 2011
- D. 1998

click This!



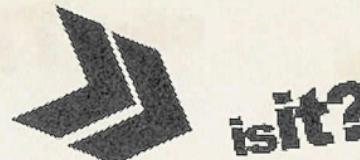
Find the  $f'(5)$  of the given function.

$$f(x) = (x+3)^4 - 4x^2$$



... and the **Answer** is!

the problem



is it?



applications in differential calculus

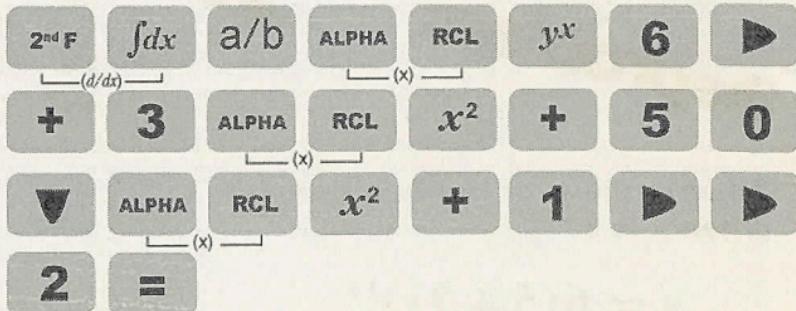
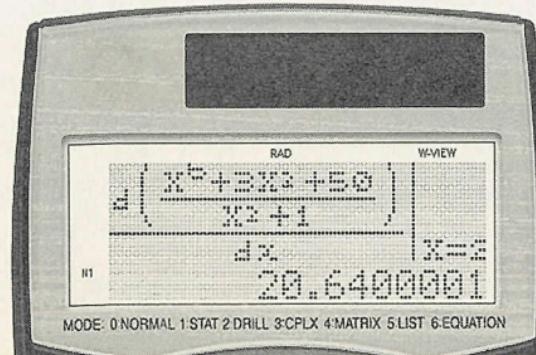
click This!

What is the first derivative of the function  $y$  at  $x = 2$ ?

$$y = \frac{x^6 + 3x^2 + 50}{x^2 + 1}$$

- A. 19.11
- B. 12.76
- C. 20.64
- D. 19.90

11



... and the Answer is!

**12**  
the problem



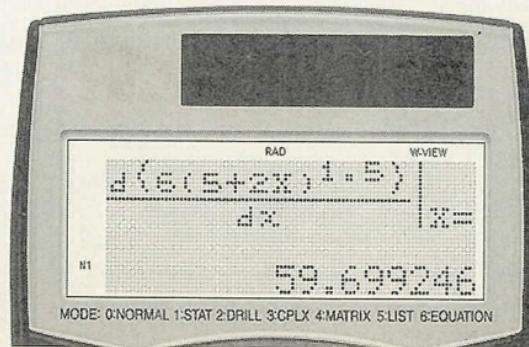
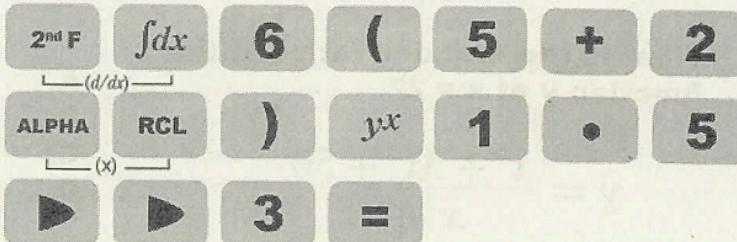
is it?

What is the  $y'$  of the function  
when  $x$  is 3?

$$y = 6(5 + 2x)^{1.5}$$

- A. 70.1
- B. 59.7
- C. 33.2
- D. 11.4

click This!



... and the Answer is!

the problem



is it?



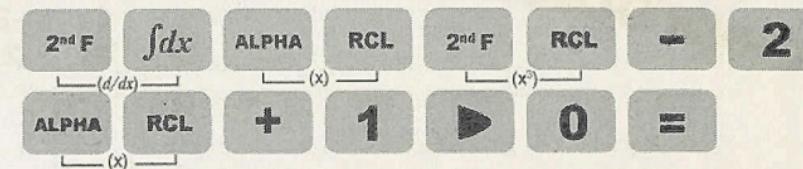
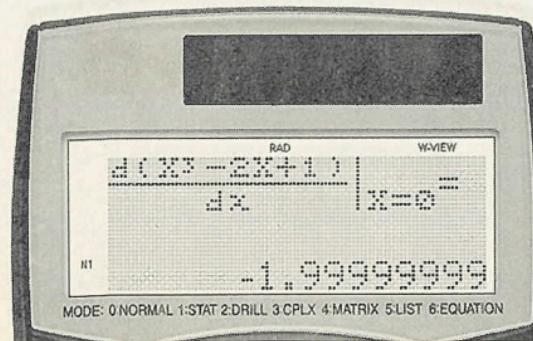
applications in differential calculus

click This!

What is the slope of the curve  $y=x^3-2x+1$  at point where it touches the y-axis?

- A. 0
- B. 1
- C. -2
- D. 3

13



... and the Answer is!

# 144

applications in differential  
calculus

# 14

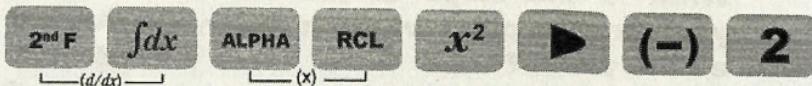
the problem



is it?

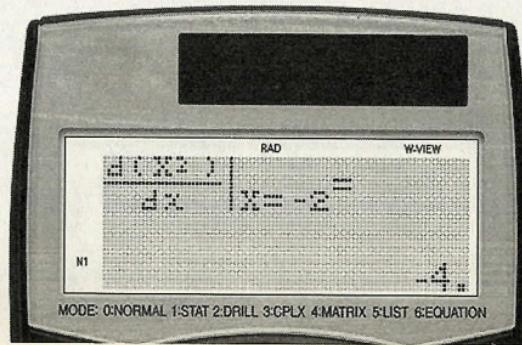
click This!

- A. -4
- B. 4
- C. -2
- D. 2



Find the slope of the tangent line to  
the parabola  $y=x^2$  at point  $(-2,4)$ .

... and the **Answer is!**



the problem



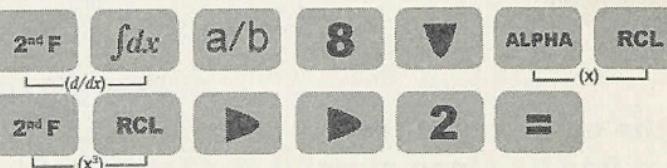
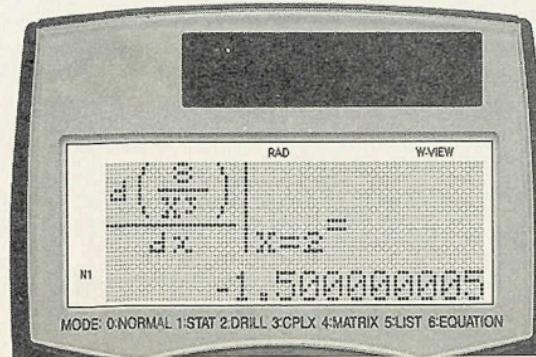
is it?



Determine the slope of  $8=yx^3$  at point (2,1).

- A. 2
- B. -1.5
- C. 4.8
- D. 1.5

15



applications in differential calculus

click This!

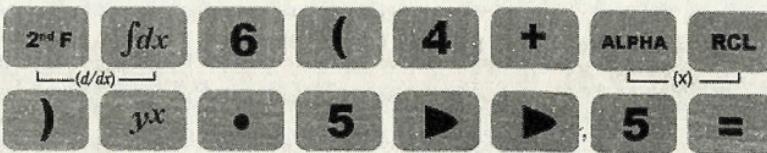
... and the Answer is!

applications in differential  
calculus

**16**  
the problem

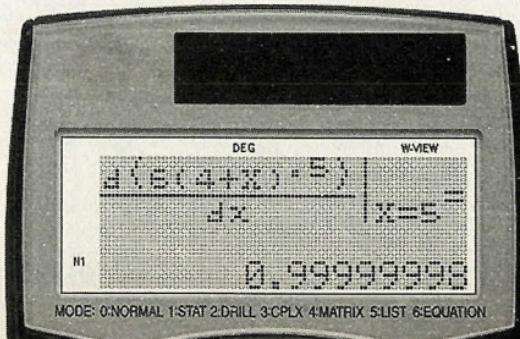
is it?

- A. 1
- B. 2
- C. 3
- D. 4



If the equation of the curve is defined by  $y$ , find its slope at point  $(5, 18)$ .

$$y = 6(4 + x)^{0.5}$$



... and the Answer is!

the problem



is it?



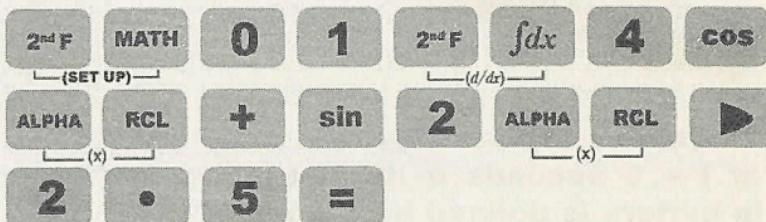
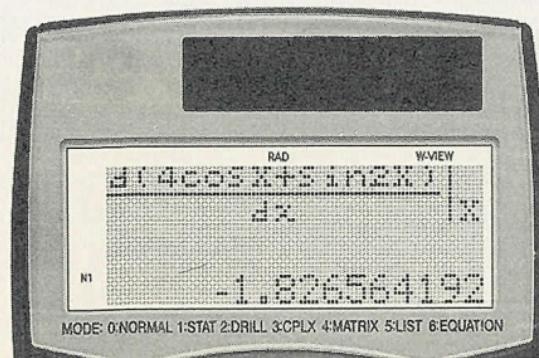
applications in differential calculus

click This!

**What is the slope of the curve  
 $y=4\cos x + \sin 2x$  when  $x = 2.5$  radians?**

- A. -1.5
- B. 1.3
- C. 1.9
- D. -1.8

17



... and the Answer is!

**18**  
the problem



is it?

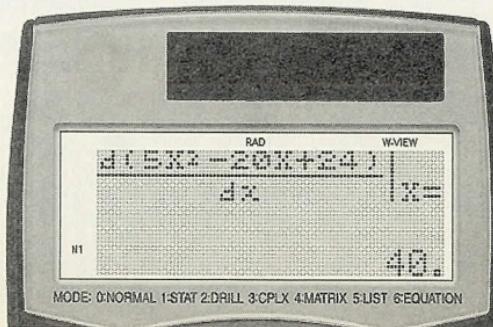
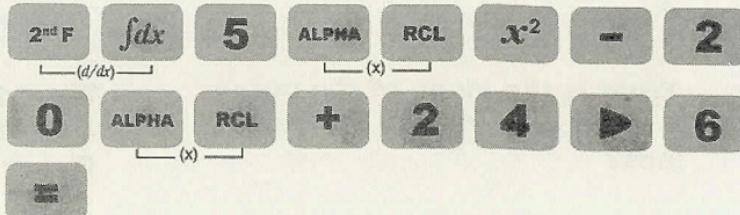
Determine the velocity of a body at  $t = 6$  seconds if its distance in meters is defined by the equation:

$$d = 5t^2 - 20t + 24$$

- A. 10
- B. 20
- C. 30
- D. 40



click This!



... and the Answer is!

the problem



is it?



applications in differential calculus

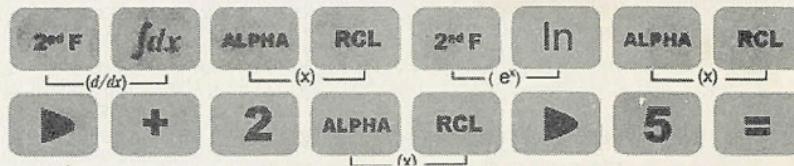
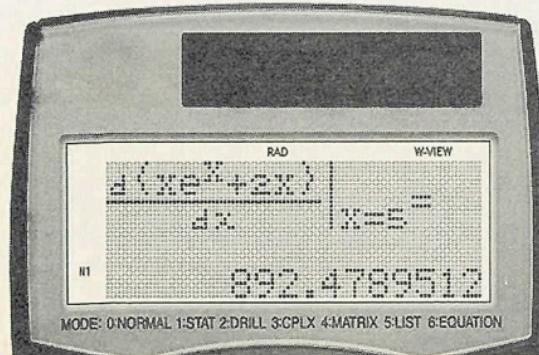
click This!

The distance travelled by an airplane is defined by  $d$ . What is its velocity at  $t = 5$  seconds?

$$d = te^t + 2t$$

- A. 892 m/s
- B. 992 m/s
- C. 1002 m/s
- D. 2002 m/s

19



... and the Answer is!

**20**  
the problem



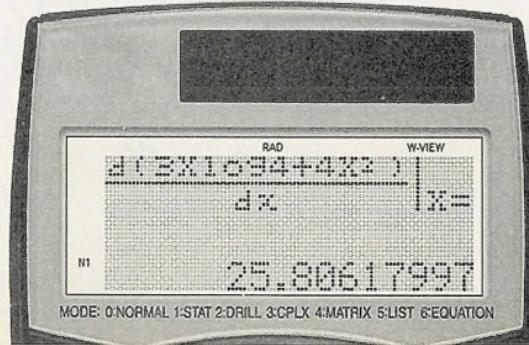
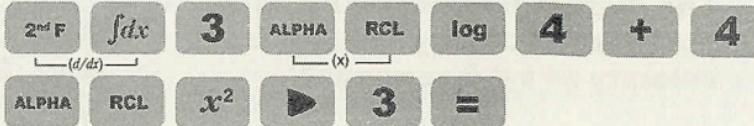
is it?

Find the acceleration of a race car when time is 3 seconds if its velocity is represented by the equation v.

$$v = 3t \log 4 + 4t^2$$

- A. 23.3 m/s<sup>2</sup>
- B. 25.8 m/s<sup>2</sup>
- C. 33.3 m/s<sup>2</sup>
- D. 12.5 m/s<sup>2</sup>

click This!



... another Answer is!

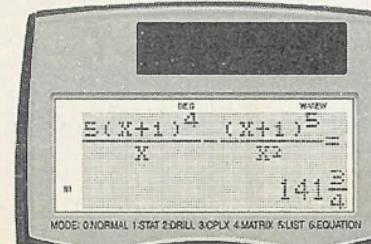
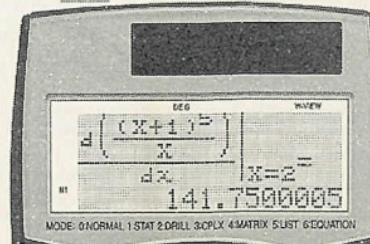
the problem

is it?

What is the first derivative of the given equation?

$$y = \frac{(x+1)^5}{x}$$

21

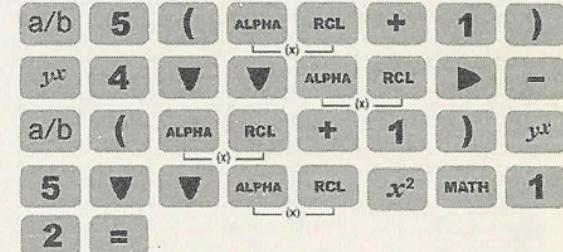
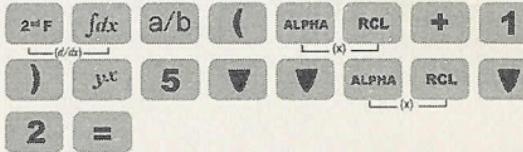


- A.  $\frac{5(x+1)^5}{x} - \frac{2(x+1)^5}{3}$
- B.  $\frac{5(x+1)^4}{x} - \frac{(x+1)^5}{x^2}$
- C.  $\frac{2(x+1)^2}{x} - \frac{(x+1)^3}{3}$
- D.  $\frac{3(x+1)}{x} - \frac{2(x+1)}{3}$

applications in differential calculus

click This!

**Solution:** Apply Calculator Mathematics procedure and use 2 as the arbitrary constant



... and the Answer is!

**22**  
the problem

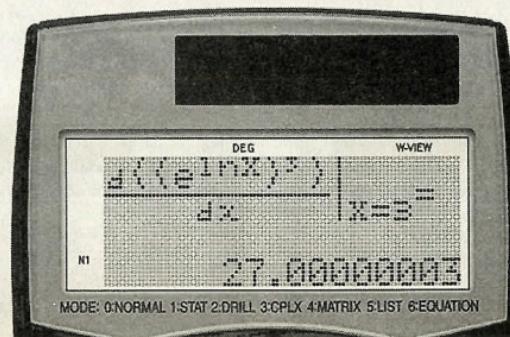
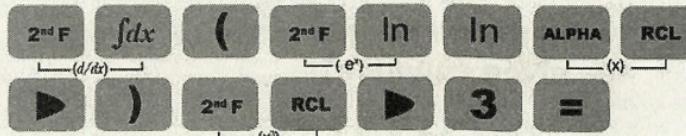


is it?



click This!

**Solution:** Apply Calculator Mathematics procedure and use 3 as the arbitrary constant



Find the first derivative of the given equation.

$$y = (e^{\ln x})^3$$

... and the **Answer** is!

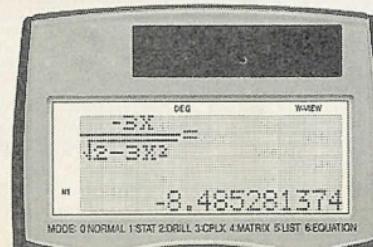
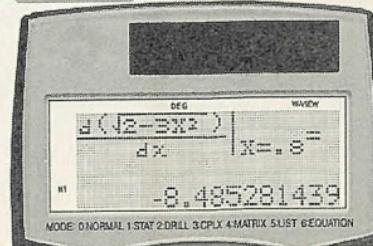
the problem



**Find the first derivative of the given equation.**

$$y = \sqrt{2 - 3x^2}$$

**23**

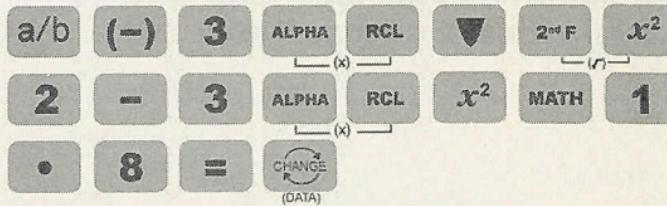
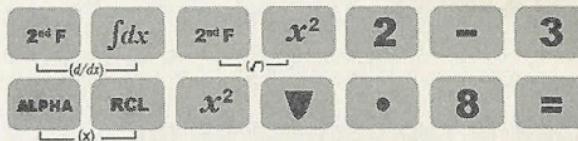


- A.  $\frac{-3x^2}{\sqrt{2 - 3x^2}}$
- B.  $\frac{-x}{\sqrt{2 - 3x^2}}$
- C.  $\frac{-2x}{\sqrt{2 - 3x^2}}$
- D.  $\frac{-3x}{\sqrt{2 - 3x^2}}$

applications in differential calculus

**click This!**

**Solution:** Apply Calculator Mathematics procedure and use 0.8 as the arbitrary constant



... and the **Answer** is!

# 54

applications in differential  
calculus

# 24

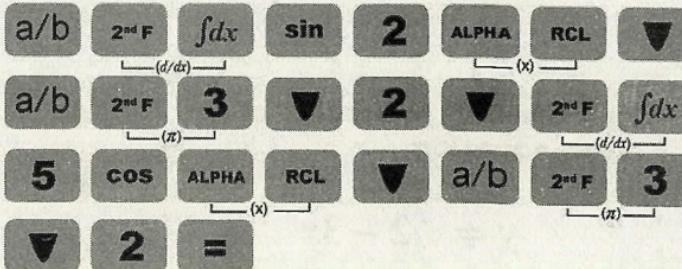
the problem



is it?

- A. 0.1
- B. 0.5
- C. 0.4
- D. 1.3

click This!



... and the Answer is!

the problem

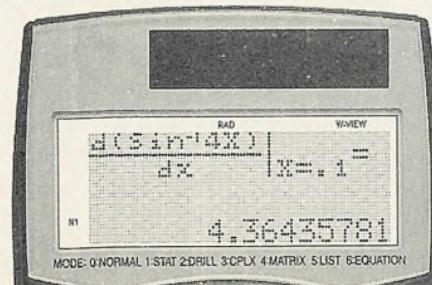


is it?

Determine the first derivative of

$$y = \arcsin 4x$$

25



A.  $\frac{4}{\sqrt{1 - 16x^2}}$

B.  $\frac{4}{\sqrt{1 + 4x^2}}$

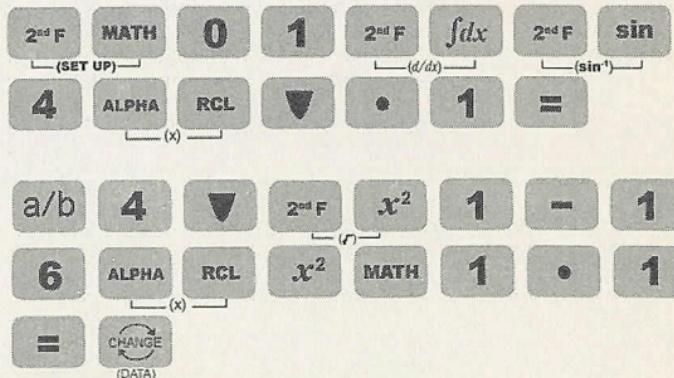
C.  $\frac{-4}{\sqrt{1 + 4x^2}}$

D.  $\frac{-4}{\sqrt{1 + 16x^2}}$

applications in differential calculus

## click This!

**Solution:** Apply Calculator Mathematics procedure and use 0.1 as the arbitrary constant



... and the **Answer** is!

**156**

applications in integral  
**calculus**

# T

he integral function of your calculator is very easy to use since it is a WRITE VIEW enabled calculator. Pressing the Integral Key will display the integral sign with a blank lower limit, blank upper limit, and blank function. There is a special function of Sharp calculators that makes them faster to compute for the integral of a particular function. This is done by changing the integral intervals of the entire integration process. You can do this by placing a comma sign after the equation followed by the intended number of integral intervals (n).

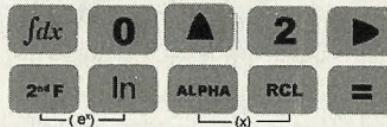
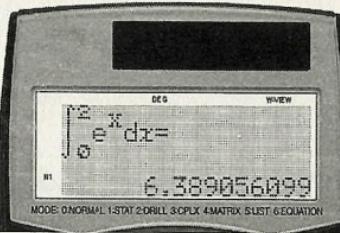
In a separate test which I did, ten (n=10) integral intervals will make the computation faster ( may be less than 10 seconds depending on the complexity of the function) and will have a negligible effect on the accuracy of the answer ( less than 0.01% error) as compared when using 100 (n=100) as the number of integral intervals. Most scientific calculators have constant integral intervals equal to 100.

*Example 1: Exact Integration 1*

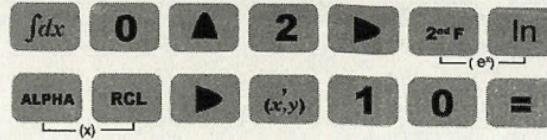
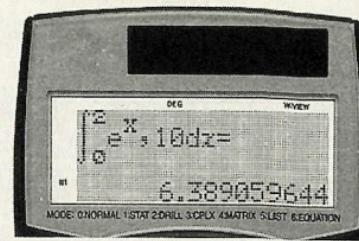
Integrate the given function.

$$\int_0^2 e^x dx$$

A. 6.39  
 C. 7.38  
 B. 10  
 D. 15.2

*Solution:*

**Step 1. Make sure calculator is in NORMAL mode. Correctly input the function in your calculator together with its lower and upper limits and solve for the answer without changing the integral intervals.**



**Step 2. Input the same function but this time, change the number of integral intervals to 10 instead of the calculator defined integral interval. Solve for the correct answer.**

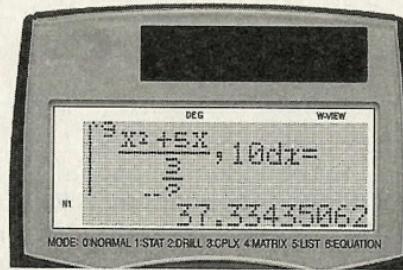
Notice that in the previous problem, it took **12** seconds for the calculator to display the answer if it is done without changing the number of integral intervals. In step 2 on the other hand, where the number of integral intervals was changed to **10**, it took the calculator just one and a half seconds (**1.5 secs**) to solve for the answer. If we compute the relative error of the two calculations, a very insignificant 0.00005 % relative error can be obtained. This proves that despite changing the number of integral intervals to 10 for the calculator, you will still have an answer that is almost 100% accurate. On top of that, your time of calculation will be reduced to almost 10% the original time when the number of integral intervals remained unchanged.

The biggest advantage of sharp calculators when compared to other calculator brands is probably its ability to save time when computing for complicated equations. During examinations, the ability to save time is a top priority. This will not only save time but also shortens the anticipation which often gives the stress during examinations.

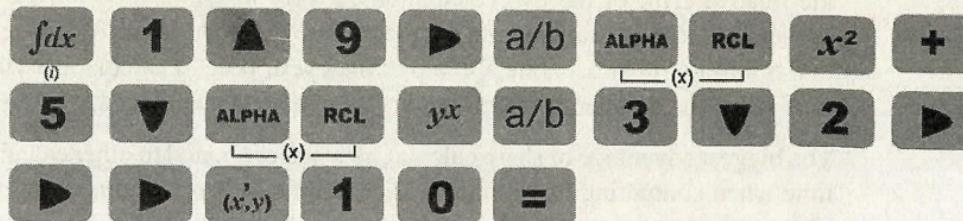
*Example 2: Exact Integration 2***Integrate the given function.**

$$\int_1^9 \frac{x^2 + 5x}{x^3} dx$$

A. 23.72  
 C. 37.33  
 B. 25.23  
 D. 39.33

**Solution:**

Make sure calculator is in NORMAL mode. Correctly input the function in your calculator. Enter the lower and upper limits respectively. Change the number of integral intervals to 10 and solve for the answer.



Unchanging the number of integral intervals will take the calculator approximately 47 seconds to compute for the correct answer while making the number of integral intervals equal to 10 will take approximately 5 seconds before the calculator displays the correct answer.

## How to Solve the Integral of Inexact Function?

The process of solving the integral of inexact equation is almost the same as solving the first derivative of an inexact function. In both processes, you have to assume an arbitrary constant. In the case of integral however, you have to assume two (2) arbitrary constants, one for the upper limit and another one for the lower limit.

For example you are asked to solve for the integral of the function  $f(x)$ . Assume upper limit equal to A and lower limit equal to B. Upon pressing the equal sign, your calculator will generate an answer *Ans*.

$$\int_B^A f(x) dx \quad (\text{equation 1})$$

Take note of this answer *Ans*.

Next is to use the choices to get the correct answer. You can do this by substituting the values of your limits in each of the choices using equation 2.

$$f(A) - f(B) \quad (\text{equation 2})$$

Applying equation 2 for each choice will give different answers. The choice which will have an answer identical to the answer when equation 1 was used in the main function is the correct answer.

*Example 3: Inexact Integration*  
Find the integral of the given function.

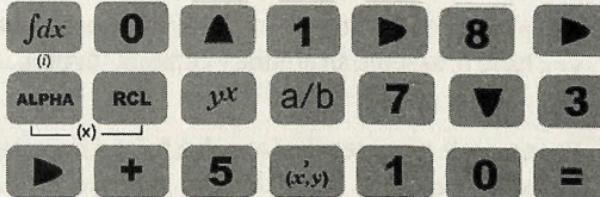
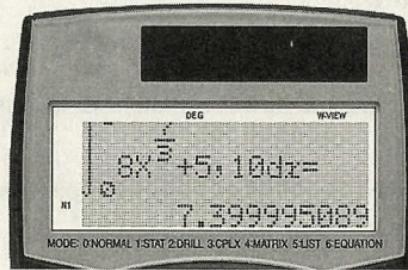
$$y = (8x^{\frac{7}{3}} + 5)dx$$

A.  $\frac{12}{5}x^{\frac{10}{3}} + 5x + C$

B.  $-\frac{12}{5}x^{\frac{10}{3}} + 5x + C$

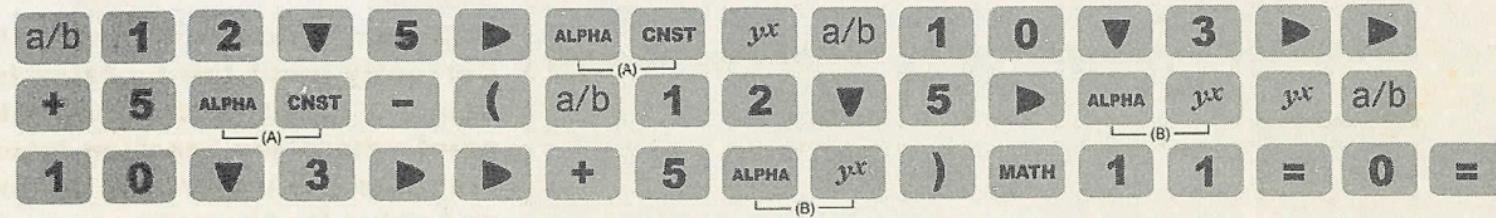
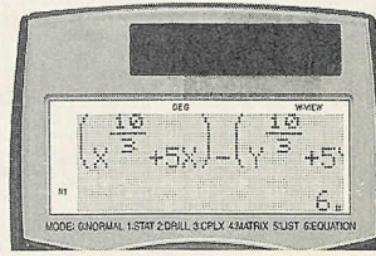
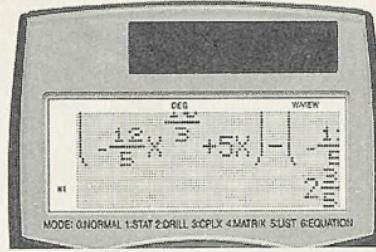
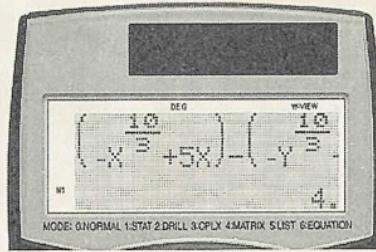
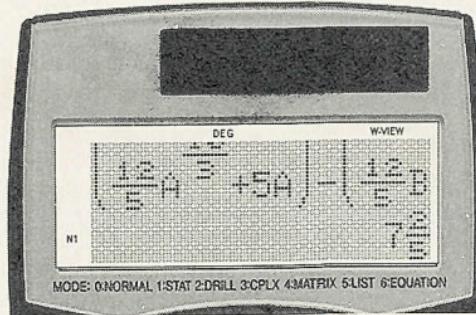
C.  $x^{\frac{10}{3}} + 5x + C$

D.  $-x^{\frac{10}{3}} + 5x + C$



*Solution:*

**Step 1. Make sure calculator is in NORMAL mode. Correctly input the function in your calculator using the assumed values for lower limit and upper limit. Use lower limit = 0 and upper limit = 1. Change the integral intervals to 10 and solve for the answer.**



Since letter A gives exactly the same answer as the main equation, this proves that it is the correct answer.

### How to Find the Area under a Curve?

The area under the curve is defined by the equation

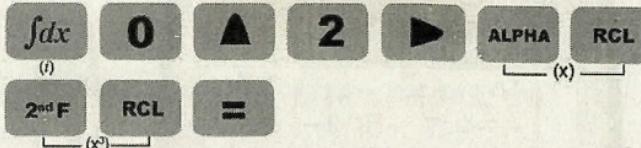
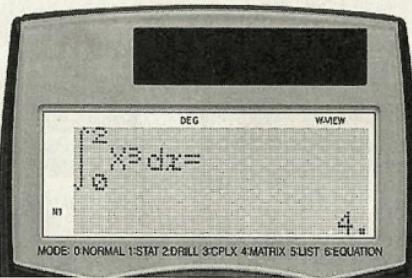
$$\text{Area} = \int_B^A f(x) dx$$

The upper limit is A and the lower limit is B.

#### *Example 4: Area under a Curve*

Find the area bounded by the curve  $y = x^3$ , the line x-axis, and  $x = 2$ .

- A. 2 sq. units
- C. 5 sq. units
- B. 4 sq. units
- D. 4.5 sq. units



#### *Solution:*

Make sure calculator is in **NORMAL** mode. Correctly input the function in your calculator. Use the x coordinates of the point where the function intersects the curve as the upper and the lower limits and solve for the answer.

### How to Solve for the Volume of a Solid of Revolution?

The volume of solid of revolution can be solved by using either the Circular Disk Method or the Hollow Cylindrical Shell Method.

#### Circular Disk Method

$$V = \pi \int_{y1}^{y2} (x_r^2 - x_l^2) dy$$

$$V = \pi \int_{x1}^{x2} (y_u^2 - y_l^2) dx$$

#### Hollow Cylindrical Shell Method

$$V = \int_{x1}^{x2} 2\pi X_c (y_u - y_l) dx$$

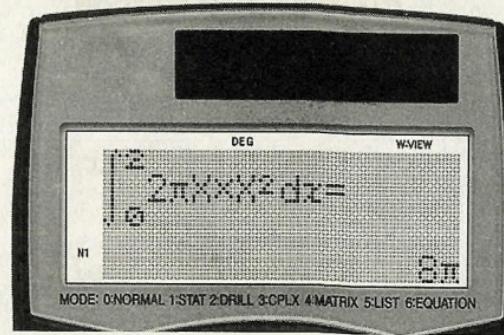
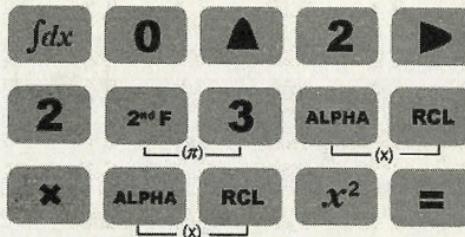
$$V = \int_{y1}^{y2} 2\pi Y_c (x_r - x_l) dy$$

**Example 3: Solid of Revolution**  
 The plane bounded by the curve  $y = x^2$ , the line  $x = 2$ , and the  $x$ -axis is revolved around the  $x$ -axis, find the volume of revolution.

- A. 9 pi cubic units
- C. 5/3 cubic units
- B. 28.13 cubic units
- D. 11/3 cubic units

*Solution:*

Make sure calculator is in **NORMAL** mode. Correctly input the function in your calculator following the hollow cylindrical shell method. Enter the lower and upper limits respectively.



## How to Solve Force – Related Problems

### A. Variable Force – Springs

The variable force in springs is defined by the Hooke's Law of Springs. This states that the force ( $F$ ) that it takes to stretch (or compress) a spring  $x$  units from its normal length is proportional to  $x$ .

$$F = kx$$

where  $F$  is the Force,  $x$  is the distance, and  $k$  is the spring constant. Since work is defined as the product of force and the distance  $d$  from point a to point b, work can be calculated using the formula

$$W = \int_b^a F(x)dx$$

### B. Force due to Liquid Pressure: Buoyancy

Buoyancy is the upward force that keeps things afloat. The net upward buoyancy force is equal to the magnitude of the weight of fluid displaced by the body. This can be represented by the equation

$$BF = dA \int h dh$$

where  $BF$  is the Buoyant Force,  $d$  is the density of the liquid, and  $h$  is the depth of the object. Furthermore, based on this equation, the buoyant force is directly proportional to the density, depth and the perpendicular area of the object where force is acted on.

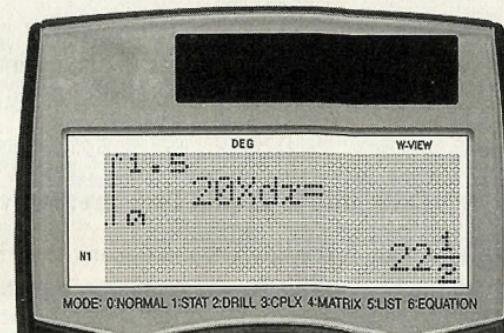
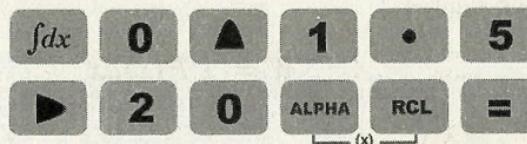
*Example 6 : Spring Problem*

What is the work done on a spring when you compress it from its natural length of 3 m to a length of 1.5 m if the spring constant is  $k = 20 \text{ N/m}$ ?

- A. 20.5 J
- B. 22.5 J
- C. 25 J
- D. 26 J

*Solution:*

By applying the equation for work, we can have the final Integral equation with limits from 0 to 1.5.



the problem



is it?

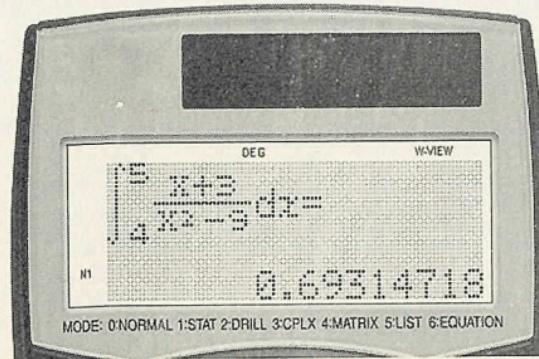


Find the integral of the given function if the lower and upper limits are 4 and 5 respectively.

- A. 0.7
- B. 0.2
- C. 0.5
- D. 1.0

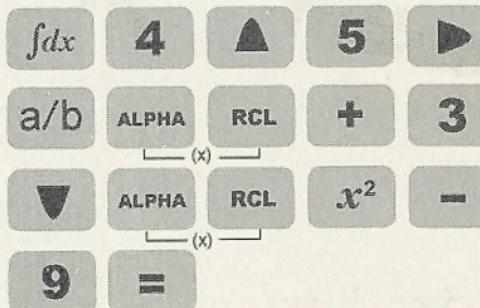
$$y = \frac{x+3}{x^2 - 9}$$

1



applications in integral calculus

click This!



... and the Answer is!

**2**  
the problem

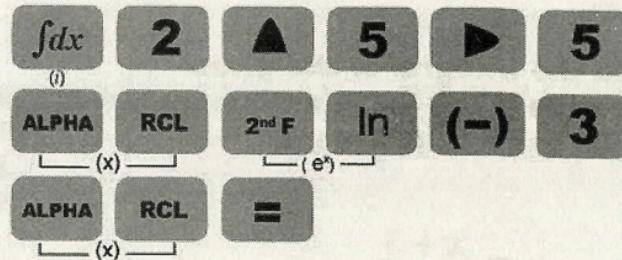


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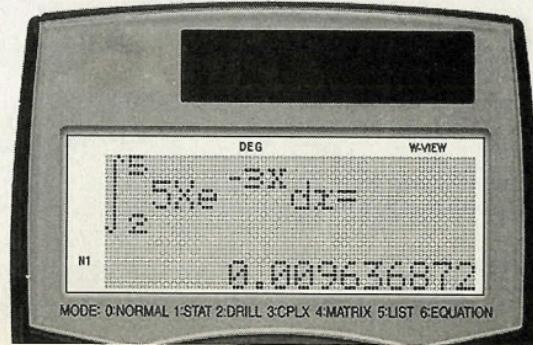
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A. 7.64 exp -3  
 B. 1.23 exp -3  
 C. 9.64 exp -3  
 D. 11.7 exp -3



Evaluate:

$$\int_{2}^{5} 5xe^{-3x} dx$$



... and the Answer is!

the problem



is it?

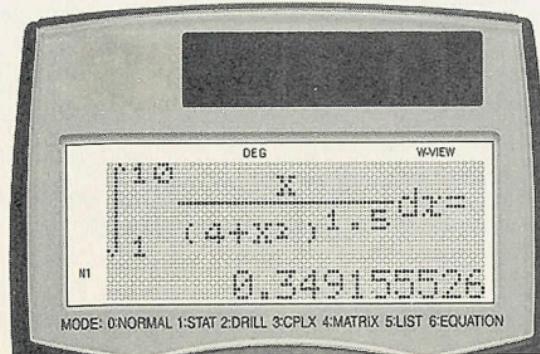


Evaluate:

$$\int_1^{10} \frac{x}{(4+x^2)^{1.5}} dx$$

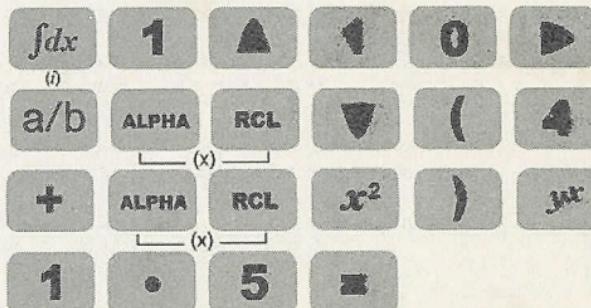
- A. 0.35
- B. 2.35
- C. 1.35
- D. 4.35

3



applications in integral calculus

click This!



...and the Answer

# 4

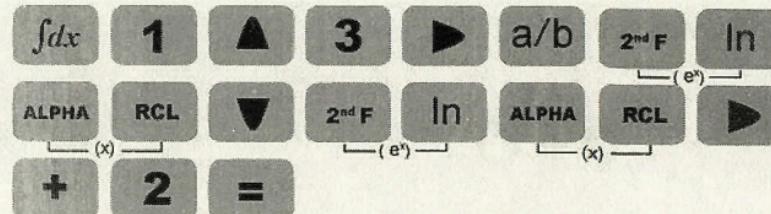
*the problem*



is it?

- A. 1.54
- B. 7.11
- C. 3.65
- D. 1.99

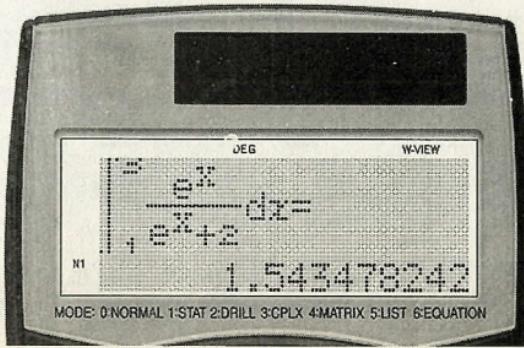
click This!



Evaluate:

$$\int_{1}^{3} \frac{e^x}{e^x + 2} dx$$

... and the Answer is!



**click This!**

the problem



is it?

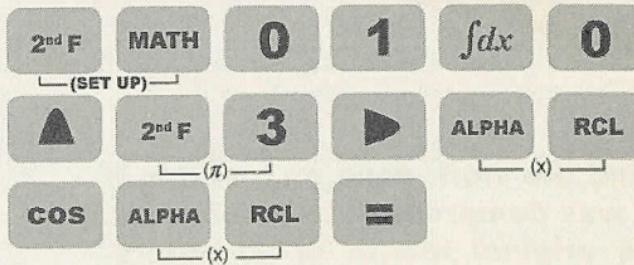
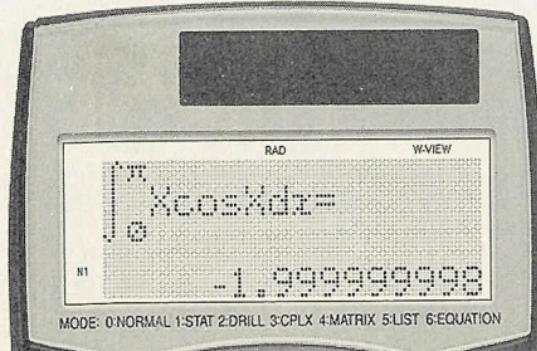


Evaluate:

$$\int_0^{\pi} x \cos x \, dx$$

- A. 0
- B. 1
- C. -2
- D. -3

5



... and the Answer is!

# 17-

applications in integral calculus

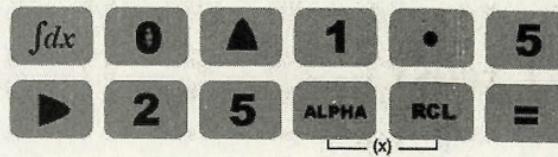
# 6 the problem



is it?

- A.  $20 \frac{1}{4}$  J
- B.  $25 \frac{3}{4}$  J
- C. 28.125 J
- D. 21.3 J

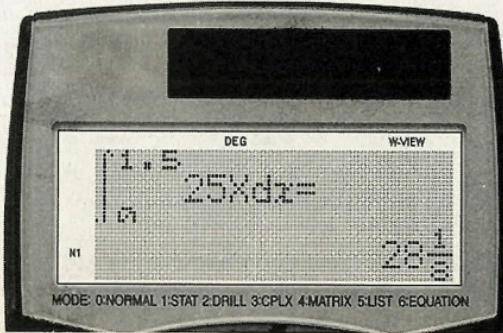
click This!



Find the work done on a spring if it was compressed to one-fourths its original length of 2 meters. The spring constant is 25 N/m.

SHARP EL-W506

... and the Answer is!



the problem



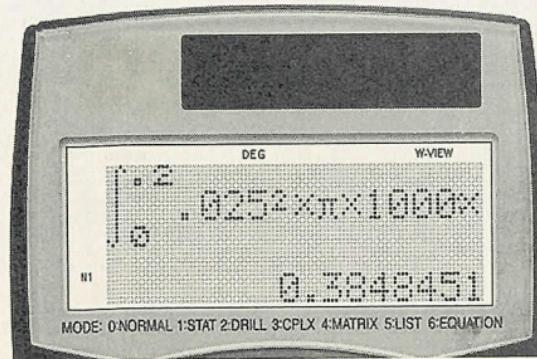
is it?



A 5 cm diameter cylinder floats in the water. How much work must be done to push the cylinder 20 cm deeper into the water?

- A. 0.38 J
- B. 2.4 J
- C. 12 J
- D. 0.013 J

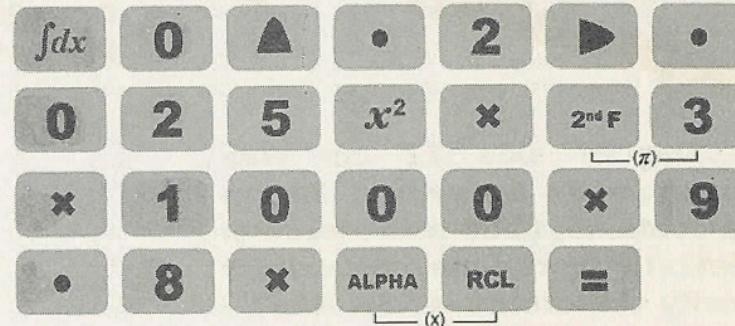
7



... and the Answer

applications in integral calculus

click This!



# 8

*the problem*

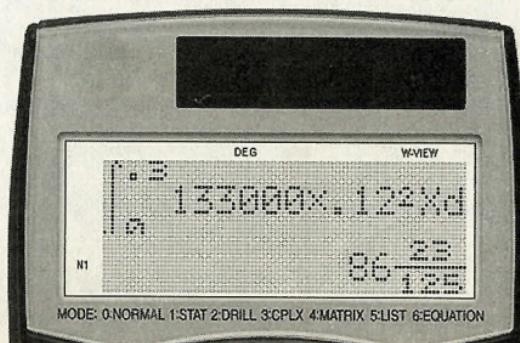
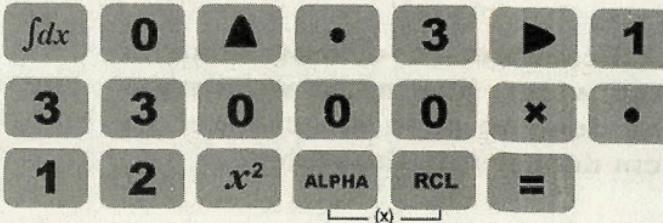


is it?

A cube of side 12 cm was submerged to a depth of 30 cm in a container filled with mercury. What is the work done if the weight density of mercury is 133kN/m<sup>3</sup>

- A. 34.5 J
- B. 86.2 J
- C. 23.6 J
- D. 112.5 J

click This!



... and the Answer is!

the problem



is it?



applications in integral calculus

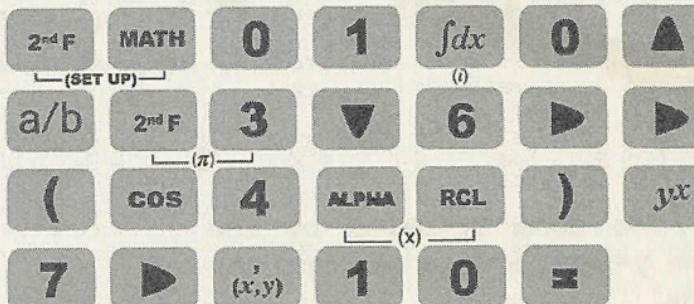
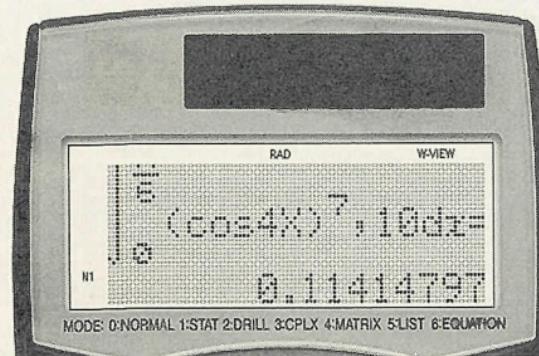
click This!

Evaluate the given integral:

$$\int_0^{\frac{\pi}{6}} \cos^7 4x dx$$

- A. 1.11
- B. 0.11
- C. 2.11
- D. 3.33

9



... and the Answer is!

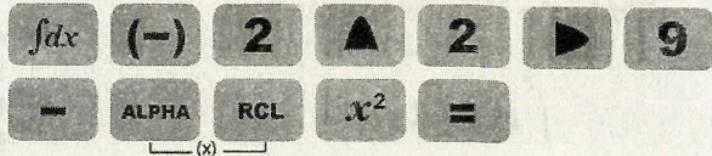
**10**  
the problem



is it?

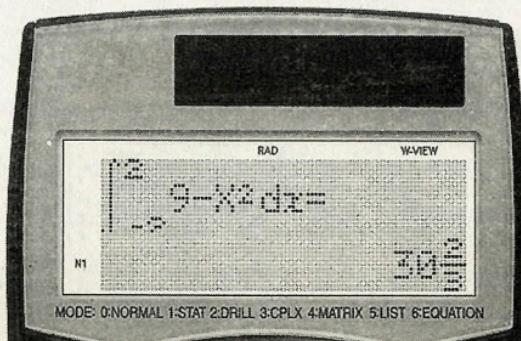
- A. 60.76
- B. 33.33
- C. 66.67
- D. 30.67

click This!



Find the area bounded by the curve  $y=9-x^2$ ,  $x=2$ ,  $x=-2$ , and the  $x$ -axis.

...and the Answer is!



**the problem**



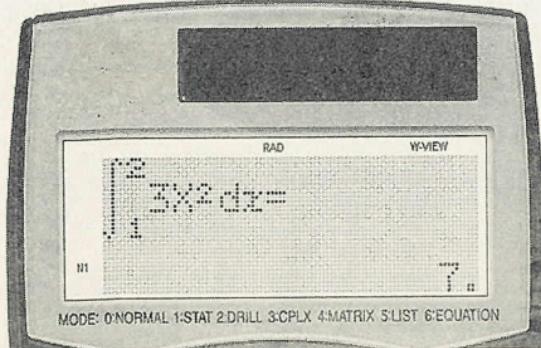
**is it?**



What is the area bounded in the first quadrant by the lines  $x=1$ ,  $x = 2$ , and  $y = 3x^2$ ?

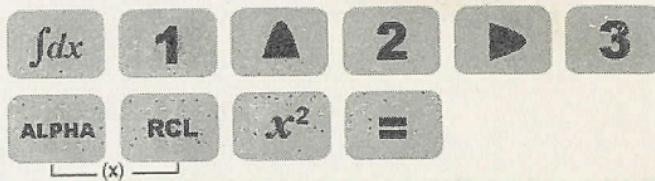
- A. 5
- B. 6
- C. 7
- D. 8

**11**



applications in integral calculus

**click This!**



**...and the Answer is!**

# 180

applications in integral  
calculus

# 12

the problem

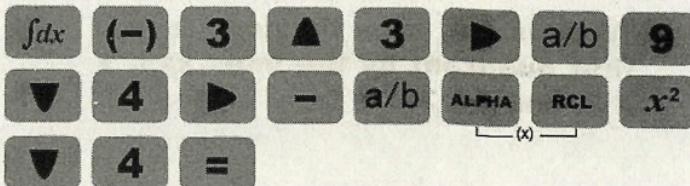


is it?



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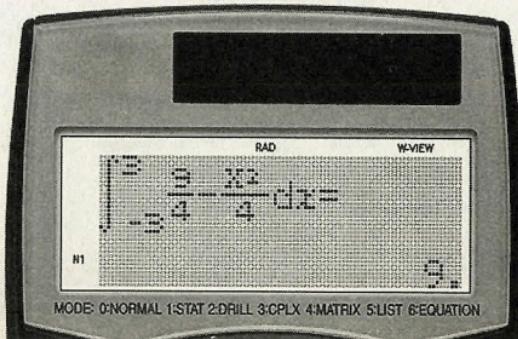
- A. 9 square units
- B. 10 square units
- C. 11 square units
- D. 12 square units



Determine the area bounded by  
the parabola  $x^2=4y$  and  $y = 9/4$ .

SHARP EL-W506

... and the Answer is!



**click This!**

the problem



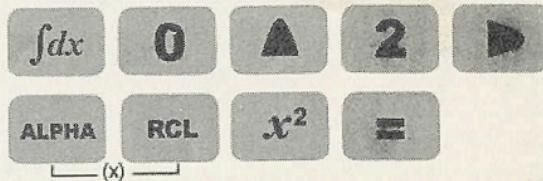
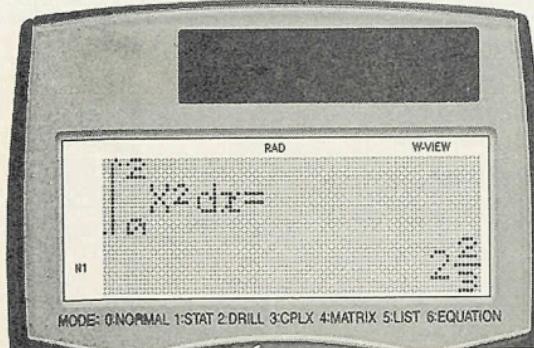
is it?



Find the area bounded by the curve  $y=x^2$ , the line  $x = 2$ , and the x-axis.

- A. 2.67 square units
- B. 3.33 square units
- C. 6.67 square units
- D. 9.99 square units

13



...and the Answer is!

**14**  
the problem

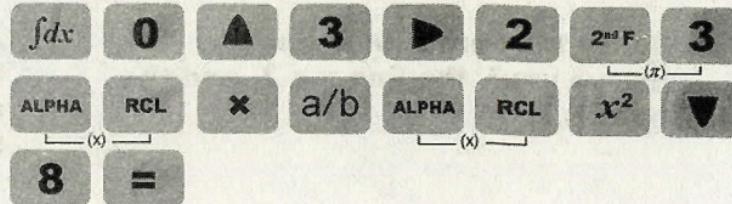


is it?



click This!

- A. 13 cubic units
- B. 14 cubic units
- C. 16 cubic units
- D. 31 cubic units

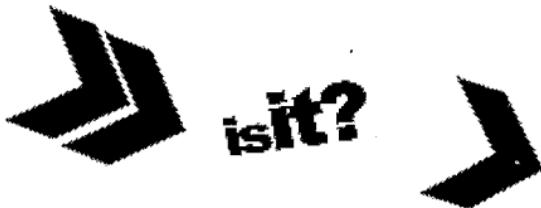


What is the volume generated when the area bounded by the curve  $x^2=8y$ ,  $x=3$ , and the x-axis in the 1st quadrant is revolved about the y-axis?

... another Answer is!



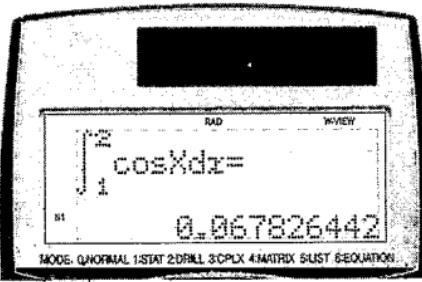
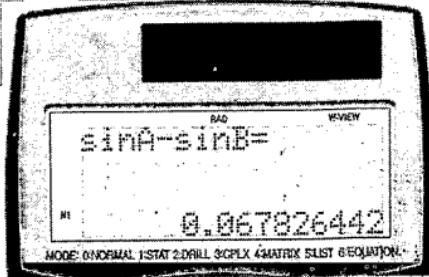
the problem



What is the integral of  $\cos x$  with respect to  $x$ ?

- A.  $\sin x + C$
- B.  $-\sin x + C$
- C.  $\tan x + C$
- D.  $\csc x + C$

15



click This!

*Solution:* Apply Calculator Mathematics procedure. Use 1 and 2 as lower and upper limits

2nd F   MATH   0   1    $\int dx$    1   ▲  
(SET UP)

2   ►   COS   ALPHA   RCL   =  
(x)

sin   ALPHA   CNST   -   sin   ALPHA    $y^x$   
(A)   (B)

MATH   1   2   =   1   =  
(A)   (B)

... and the **Answer** is!

**16**  
the problem

Evaluate:

$$\int \frac{5dx}{2x+4}$$

is it?

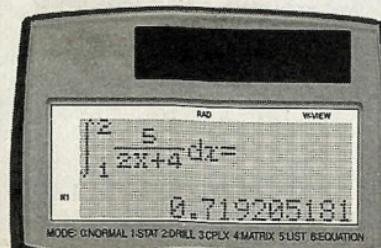
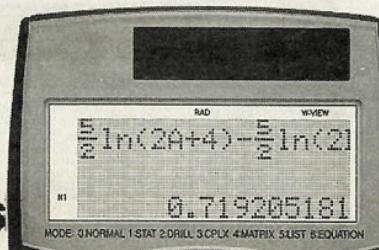


click This!

Solution: Apply Calculator Mathematics procedure. Use 1 and 2 as lower and upper limits

$\int dx$     1    ▲    2    ►    a/b    5    ▼    2  
 (i)    ALPHA    RCL    +    4    =  
 \_\_\_\_\_ (x)

a/b    5    ▼    2    ►    ln    (    2  
 ALPHA    CNST    +    4    )    -    a/b    5    ▼  
 \_\_\_\_\_ (A)    2    ►    ln    (    2    ALPHA     $x^x$     +    4  
 )    MATH    1    2    =    1    =  
 \_\_\_\_\_ (B)



... and the Answer is

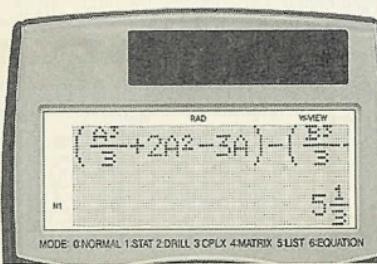
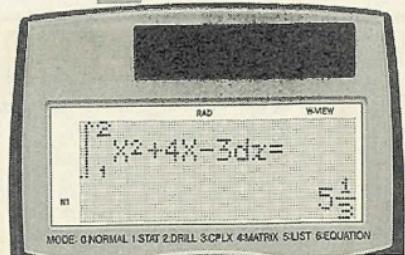
the problem



Evaluate the integral of  
 $(x^2 + 4x - 3)$ .

- A.  $\frac{2x^2}{3} + 4x^3 - 3x + C$
- B.  $\frac{x^3}{3} + 2x^2 - 3x + C$
- C.  $x^3 + 2x^2 - 3 + C$
- D.  $x^3 - 2x^2 + 3x + C$

17



applications in integral calculus

## click This!

*Solution:* Apply Calculator Mathematics procedure. Use 1 and 2 as lower and upper limits

$\int_{\underline{x}}^{\overline{x}} \underline{f(x)} \, dx$

1 ALPHA RCL 2 ALPHA RCL  $\underline{-}$  3 =

( a/b ALPHA CNST  $\underline{\underline{(A)}}$   $\underline{\underline{(x')}}$  RCL  $\downarrow$  3  $\blacktriangleright$   
 + 2 ALPHA CNST  $\underline{\underline{(A)}}$   $x^2$   $\underline{\underline{(x')}}$   $\underline{\underline{(A)}}$  3 ALPHA CNST  
 )  $\underline{\underline{(A)}}$  a/b ALPHA  $y^x$  2nd F RCL  $\downarrow$   
 3  $\blacktriangleright$  + 2 ALPHA  $y^x$   $x^2$   $\underline{\underline{(B)}}$   $\underline{\underline{(x')}}$   $\underline{\underline{(B)}}$  3  
 ALPHA  $y^x$  ) MATH 1 2  $\underline{\underline{=}}$  1

... and the Answer is!

# 18

*the problem*

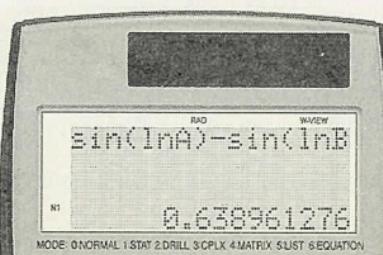
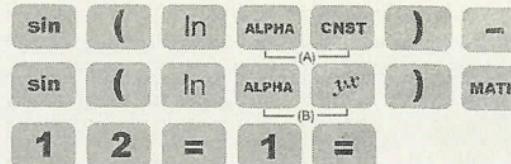
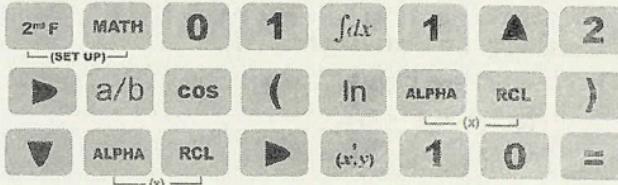


is it?



click This!

Solution: Apply Calculator Mathematics procedure. Use 1 and 2 as lower and upper limits



Evaluate:

$$\int \frac{\cos(\ln x)}{x} dx$$

... and the Answer is

the problem

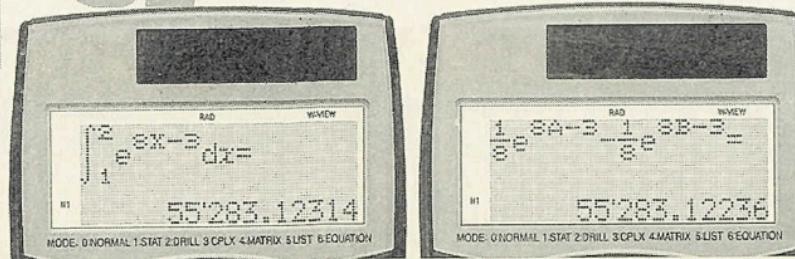


Evaluate the given integral.

$$y = \int e^{(8x-3)} dx$$

A.  $\frac{1}{8}e^{(8x-3)} + C$   
 B.  $\frac{1}{4}e^{(8x-3)} + C$   
 C.  $-\frac{1}{4}e^{(8x-3)} + C$   
 D.  $-\frac{1}{8}e^{(8x-3)} + C$

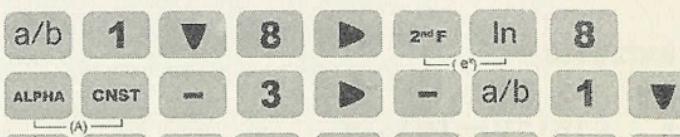
19



applications in integral calculus

click This!

**Solution:** Apply Calculator Mathematics procedure. Use 1 and 2 as lower and upper limits



... and the Answer is!

# 20

*the problem*

Evaluate:

$$\int \frac{\ln(5x - 10)}{3x - 6} dx$$

... and the Answer is!

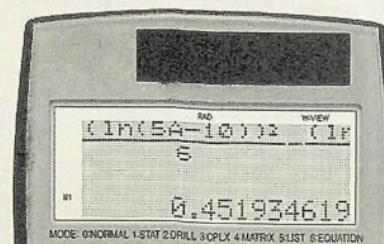
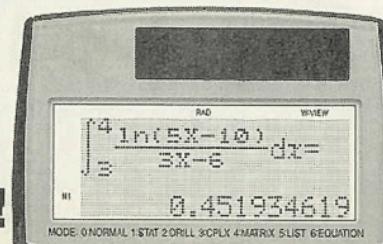
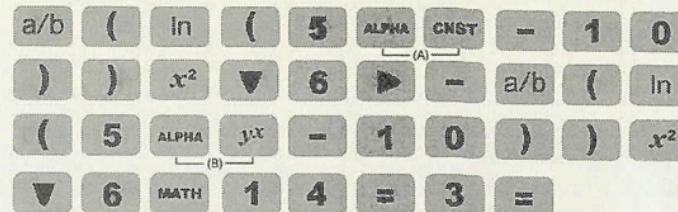
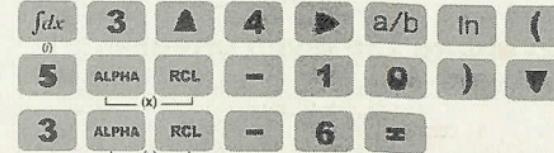
is it?

- A.  $\frac{[\ln(5x - 10)]^2}{3} + C$
- B.  $\frac{[\ln(5x - 10)]^2}{6} + C$
- C.  $\frac{[\ln(5x - 10)]^2}{2} + C$
- D.  $\frac{[\ln(5x - 10)]^3}{2} + C$



**click This!**

Solution: Apply Calculator Mathematics procedure. Use 3 and 4 as lower and upper limits



A **complex number** is defined as a number that combines a real number and an imaginary number in the form of  $a + bi$  where  $a$  and  $b$  are real numbers while  $i = \sqrt{(-1)}$ . In your calculator, complex number calculations can be done by pressing MODE followed by pressing the number 3.

Complex numbers are a field, which means that it can have addition, subtraction, multiplication, and division operations. In fact, it even extends to getting the squares, cubes, etc and these are often visible in many examinations. Before you can proceed to any calculation in-

volving complex numbers may it be in rectangular or polar format, you must first put your calculator to COMPLEX mode. The inability to properly input the correct format of a complex number in your calculator will definitely give an error result. SHARP EL-W506 will automatically display the entire complex number upon pressing the equal sign, regardless whether in rectangular or polar form.

SHARP EL – W506 is an Auto-Rationalizer when it comes to complex numbers. This means that if an irrational complex number is typed in the calculator, pressing the equal sign will automatically convert the complex number in its rationalized format. A complex number is considered irrational if it is expressed as a fraction and the complex number  $i$  is present in the denominator. In Mathematics, the proper method of rationalizing an irrational complex number is by multiplying the term with its conjugate.

The imaginary number  $i$  is located below the integral sign. Your calculator will automatically display the imaginary number upon pressing the integral sign. The angle in the polar format is located below the DMS key. Likewise, your calculator will automatically display the angle upon pressing the DMS key.

### How to Transform a Complex Number?

The transformation of a complex number from rectangular ( $a+bi$ ) to polar ( $r\angle\theta$ ) or vice versa in SHARP EL-W506 can be done either before or after the computation process. Upon pressing the number 3 which corresponds to CMPLX in the MODE key, the calculator will automatically set the complex mode in RECTANGULAR format. The  $xy$  in the leftmost part of the screen confirms that the calculator will display answers in rectangular format. You can change the current format into polar form by simply pressing 2ndF followed by the number 8.

Changing the format of the complex number after a computation process can be done by pressing either 2ndF followed by the number 8 or by 2ndF followed by the number 9. The complex number indicators ( $xy$  and  $r\theta$ ) that can be found on the leftmost part of the screen will confirm the format of the complex number.

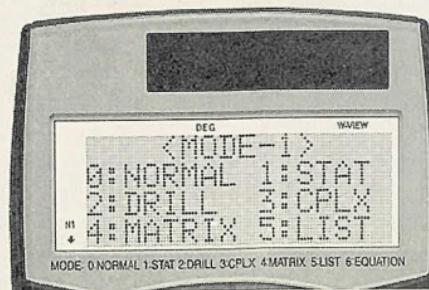
#### *Example 1: Sum of Complex*

**What is the sum of the two complex numbers? Express the answer in polar format.**

$$7i + 5\angle 30$$

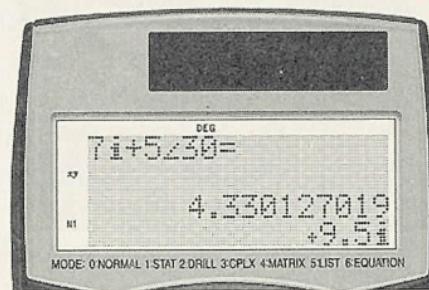
*Solution:*

*Step 1. Go to COMPLEX mode.*



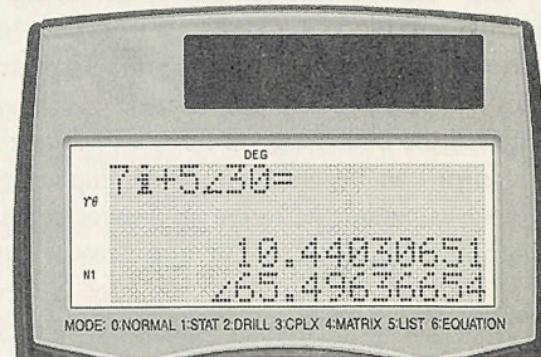
MODE 3

*Step 2. Enter the equation correctly and solve for the answer.*



7  $\int dx$  + 5 D'M'S  
3 0 =

*Step 3. Transform the answer into polar format.*



2<sup>nd</sup> F 8  
 $\angle(\rightarrow r\theta)$

## How to Simplify a Complex Number?

SHARP EL-W506 doesn't have the ability to read complex numbers when raised to a high number that is why directly inputting the given term will result to an error answer. But having acquired the knowledge in Laws of Exponents, this error can be easily resolved. Inputting  $i^2$  in your calculator will give an answer equal to -1 while inputting  $i^3$  will give an answer equal to  $-ii$ . Inputting  $i^4$  in your calculator however will give an error answer. Likewise, complex numbers in polar form will be read if and only if the power will not exceed 3. Otherwise, your knowledge in Laws of Exponents shall be put into usage.

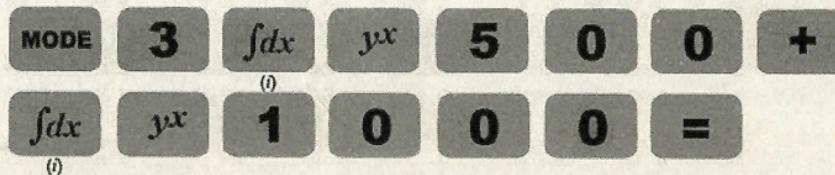
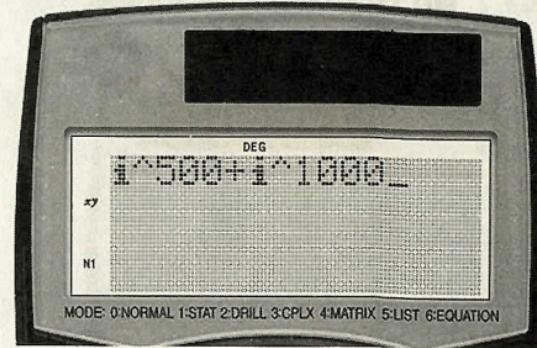
*Example 2: Complex Power*

Simplify.

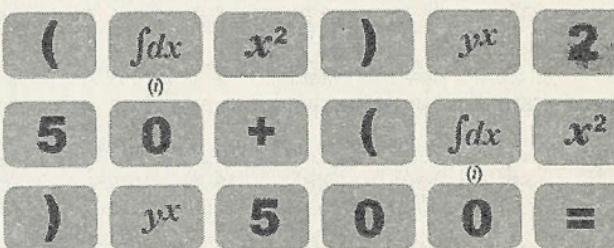
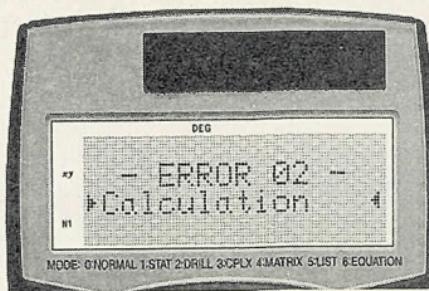
$$i^{500} + i^{1000}$$

*Solution:*

**Step 1. Go to complex mode and try to directly input the given term.**



**Step 2.** Now try to use your knowledge in Laws of Exponents and input the equation in your calculator.



The term  $i^2$  by definition is equal to negative 1. All negative numbers when raised to an even number will give positive answer that is why the term  $(i^2)^{250}$  will have an answer equal to positive 1. The second term when expressed in terms of  $i^2$  will also have an answer equal to positive 1 that is why the final answer for the problem is positive 2.

## Vectors

Your calculator has 4 pre-determined vectors using the LIST mode. These are vectors L1, L2, L3, and L4. The vector analysis is just one application of the LIST mode. The LIST mode can also do statistical calculations like standard deviation, minimum value, maximum value and variance. In addition to the four arithmetic functions (Addition, Subtraction, Multiplication, and Division), the square, cube and inverse of a LIST can also be calculated.

Prior to calculations, the LIST data must be entered first. Pressing MATH followed by the number 2 which corresponds to EDIT will allow

you to enter each datum including the size of the list. To save a LIST, press MATH followed by the number 4 and specify the location by choosing among the four pre-determined lists. To enter additional vectors, or lists, press MATH followed by the number 2 and the calculator is again ready to accept additional lists. After editing, don't forget to STORE the new list using MATH 4.

Vector addition, subtraction, multiplication, and division can be performed in the LIST mode of SHARP EL – W506. A special key in solving the absolute value of the vector as well as solving for the dot product (inner product) can also be found in the key pad of SHARP EL – W506.

### Length of a Vector

The length or magnitude or norm or absolute value of the vector  $a$  is denoted by  $|a|$ . The length of the vector  $a = a_1e_1 + a_2e_2 + a_3e_3$  in a three-dimensional Euclidean space, where  $e_1, e_2, e_3$  are orthogonal unit vectors, can be computed with the Euclidean norm

$$\|a\| = \sqrt{a_1^2 + a_2^2 + a_3^2}$$

Which, is a consequence of the Pythagorean theorem since the basis vectors  $e_1, e_2, e_3$  are orthogonal unit vectors.

## Dot Product of Vectors

The dot product of two vectors (from an orthonormal vector space)  $a = [a_1, a_2, \dots, a_n]$  and  $b = [b_1, b_2, \dots, b_n]$  is by definition:

$$a \cdot b = \sum_{i=1}^n a_i b_i = a_1 b_1 + a_2 b_2 + \dots + a_n b_n$$

where  $\Sigma$  denotes summation notation.

For example, the dot product of two three-dimensional vectors  $[5 \ 3 \ 5]$  and  $[2 \ -2 \ 1]$  is

$$[5 \ 3 \ 5] \cdot [2 \ -2 \ 1] = (5)(2) + (3)(-2) + (5)(1) = 9$$

Using matrix multiplication and treating the (column) vectors as  $n \times 1$  matrices, the dot product can also be written as:

$$a \cdot b = a^T b$$

where  $a^T$  denotes the transpose of the matrix  $a$ .

Using the example from above, this would result in a  $1 \times 3$  matrix (i.e., vector) multiplied by a  $3 \times 1$  vector (which, by virtue of the matrix multiplication, results in a  $1 \times 1$  matrix, i.e., a scalar):

$$[5 \ 3 \ 5] \cdot \begin{bmatrix} 2 \\ -2 \\ 1 \end{bmatrix} = 9$$

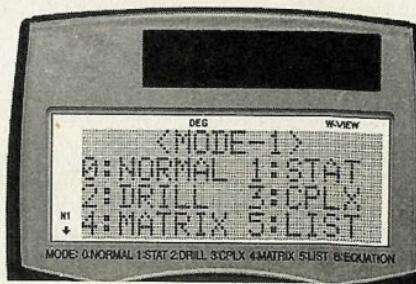
*Example 3: Absolute Value of a Vector*

**What is the absolute value of vector D?**

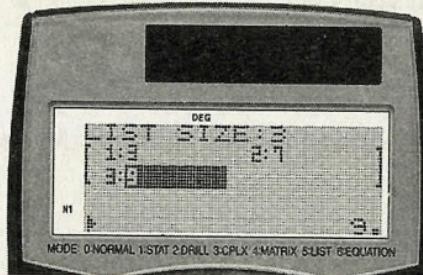
$$D = [3 \ 7 \ 9]$$

**Solution:**  
**Step 1. Go to LIST mode.**

MODE      5

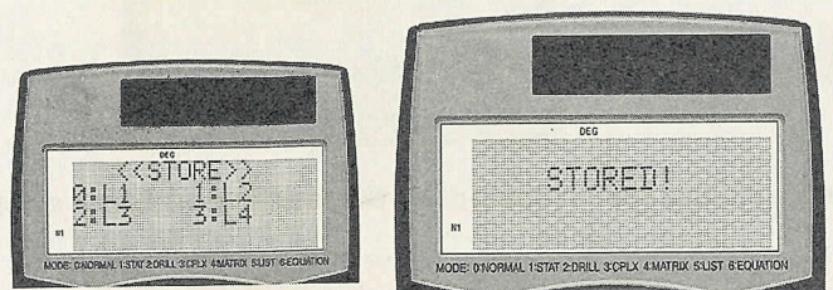


**Step 2. Input the size of the list followed by the list data.**



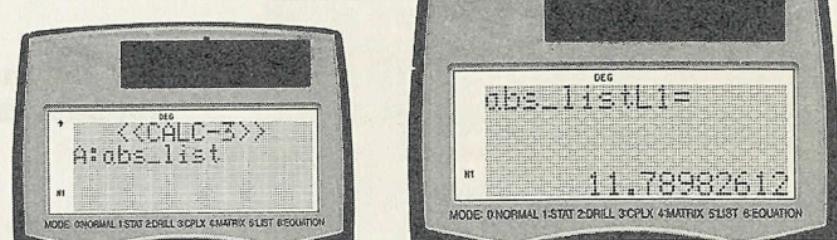
MATH      2      3      =      3      =  
7      =      9      =

**Step 3. STORE the LIST  
to a chosen position.**



ON/C    MATH    4    0

**Step 4. Get the absolute  
value of the list.**



MATH    6    CNST  
(A)  
MATH    1    0    =

*Example 4: Dot Product*

What is the dot product of the two vectors given?

$$\mathbf{A} = \begin{bmatrix} 2 & 5 & 8 \end{bmatrix}$$

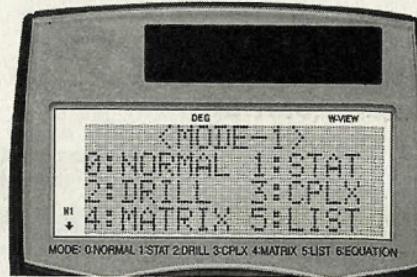
$$\mathbf{B} = \begin{bmatrix} 3 & 1 & 4 \end{bmatrix}$$

*Solution:*

Step 1. Go to LIST mode.

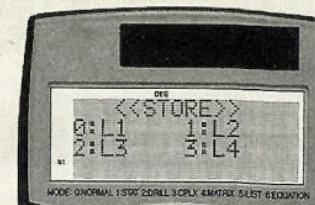
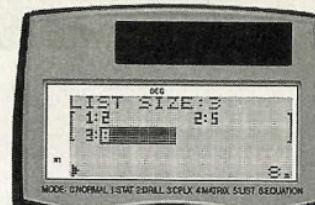
MODE

5



Step 2. Input the size of the list followed by the list data. Save each list separately.

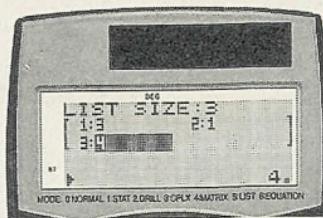
For vector A:



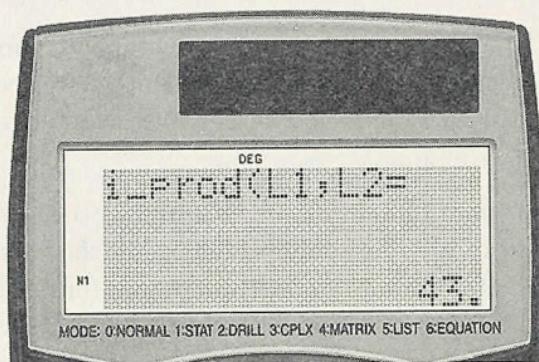
MATH    2    3    =    2    =    5  
 =    8    =    ON/C    MATH    4    0

*Step 3. Get the dot product of the two vectors.*

For Vector B:



MATH    2    3    =    3    =    1  
 =    4    =    ON/C    MATH    4    1



MATH    6    9    MATH    1    0  
 (x,y)    MATH    1    1    =

## Matrices

A **matrix** is a rectangular arrangement of numbers with a known number of rows and number of columns. Like vectors, matrices can be added, subtracted, multiplied and divided. There are also unique operations in matrices like determinant, transpose, and inverse.

In reality, the number of rows and columns can be as many as 50. However, in your calculator, the minimum number of rows and columns is 2 while the maximum number of rows and columns is 4. This allows you to perform operations for matrices with number of rows and columns not greater than 4. Your calculator is also capable of storing 4 matrices all at the same time.

Under matrix mode, pressing MATH will give you the sub-menu for matrices. The sub-menu under matrix mode will allow you to perform several calculations including determinants, transposes, the four arithmetic functions, cube, square, and the square of a matrix. Please refer to your manual for the other commands under this sub-menu.

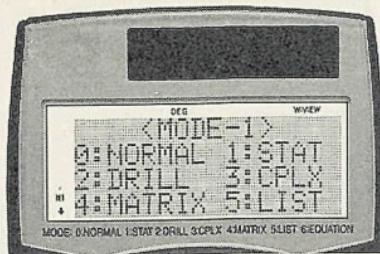
### *Example 5: Determinant*

**Solve for the determinant of Matrix A.**

$$A = \begin{bmatrix} 5 & 1 & 9 & 9 \\ 8 & 8 & 4 & 5 \\ 1 & 3 & 7 & 4 \\ 2 & 4 & 3 & 2 \end{bmatrix}$$

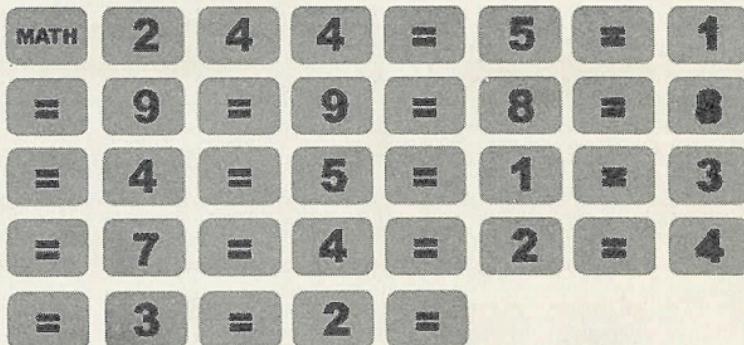
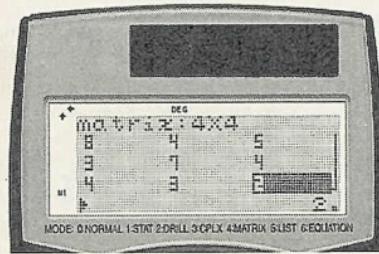
*Solution:*

**Step 1.** Go to matrix mode.



MODE 4

**Step 2.** Input the correct number of rows, columns, and elements.



# 202

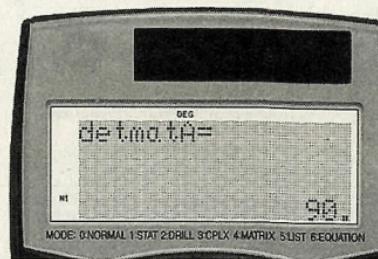
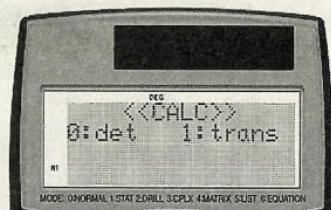
## advanced mathematics

**Step 3. Save the matrix in your calculator.**



ON/C   MATH   4   0

**Step 4. Determine the determinant.**



MATH   6   0   MATH   1   0   =

## How to Solve System of Linear Equations?

The method of using Matrix in analyzing System of Linear Equations is an effective and easy tool in determining the values of the unknown. This is important because the EQUATION mode of SHARP EL – W506 is limited only to 3 – Value Linear Equation. Maximizing the use of the MATRIX mode of the calculator will permit us to solve Systems of Linear Equations in four unknowns.

I chose the INVERSE method in solving for the unknowns. There are two things to consider before doing this. First, the system must have the same number of equations as variables, that is, the coefficient matrix of the system must be square i.e., 2 – equations – 2 – unknowns, 3 – equations – 3 – unknowns. The coefficient matrix is the matrix that will be formed using the coefficients of the linear equations. And second, the determinant of the coefficient matrix must be non-zero. The reason, of course, is that the inverse of a matrix exists precisely when its determinant is non-zero.

$$a_1X + b_1Y + c_1Z + d_1W = k_1$$

$$a_2X + b_2Y + c_2Z + d_2W = k_2$$

$$a_3X + b_3Y + c_3Z + d_3W = k_3$$

$$a_4X + b_4Y + c_4Z + d_4W = k_4$$

Consider the given system of linear equation.

Using matrices, particularly the method of inverse, we can get the solution to the given system of linear equations by using the coefficients of the linear equations. If we define Matrix A as the coefficient matrix, and Matrix B as the constant matrix, then we have

$$\text{Mat } A = \begin{bmatrix} a_1 & b_1 & c_1 & d_1 \\ a_2 & b_2 & c_2 & d_2 \\ a_3 & b_3 & c_3 & d_3 \\ a_4 & b_4 & c_4 & d_4 \end{bmatrix} \quad \text{Mat } B = \begin{bmatrix} k_1 \\ k_2 \\ k_3 \\ k_4 \end{bmatrix}$$

The value of the unknowns X, Y, Z, and W can be obtained by multiplying the inverse of Matrix A and Matrix B.

$$\begin{bmatrix} X \\ Y \\ Z \\ W \end{bmatrix} = \text{Mat } A^{-1} \cdot \text{Mat } B$$

### How to Solve for the Inverse of a Matrix?

In real numbers, the inverse of any real number  $a$  is the number  $a^{-1}$ , such that  $a$  times  $a^{-1}$  equals 1. We knew that for a real number, the inverse of the number was the reciprocal of the number, as long as the number wasn't zero.

The inverse of a square matrix  $A$ , denoted by  $A^{-1}$ , is the matrix so that the product of  $A$  and  $A^{-1}$  is the Identity matrix. The identity matrix that results will be the same size as the matrix  $A$ .

*Example 6: Inverse of a Matrix*

**Find the inverse of the matrix given:**

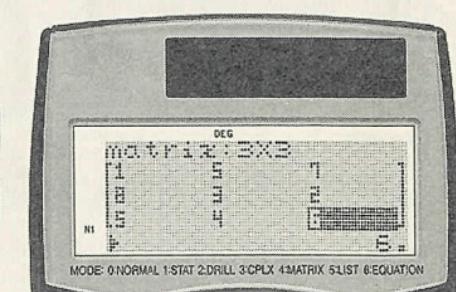
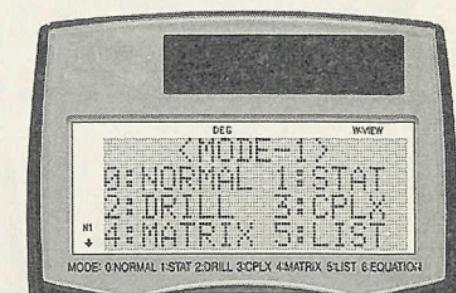
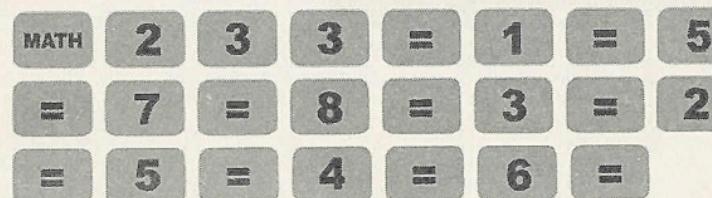
$$A = \begin{bmatrix} 1 & 5 & 7 \\ 8 & 3 & 2 \\ 5 & 4 & 6 \end{bmatrix}$$

*Solution:*

**Step 1. Go to matrix mode.**

MODE      4

**Step 2. Input the correct number of rows, columns, and elements.**



**Step 3. STORE the matrix in your calculator.**



**Step 4. Determine the Inverse.**



$(x^{-1})$

**Example 7: Four Unknowns**

**Find the value of W in the given system of linear equations.**

$$10X - 2Y + 2Z + 3W = 6$$

$$2X + 3Y - Z + 5W = -4$$

$$3X - 4Y + 2Z - 4W = 12$$

$$12X - Y - 3Z + 2W = -20$$

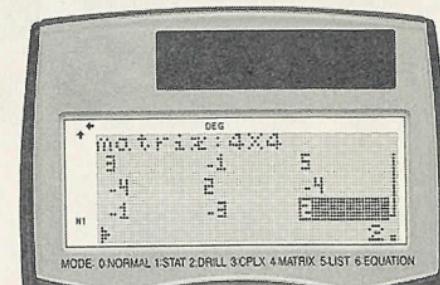
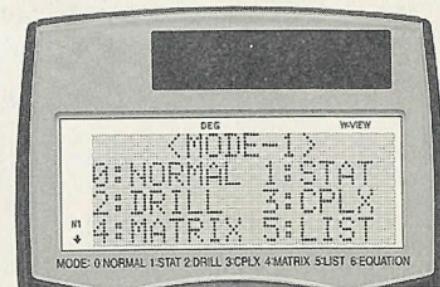
**Solution:****Step 1. Go to MATRIX mode.**

MODE

4

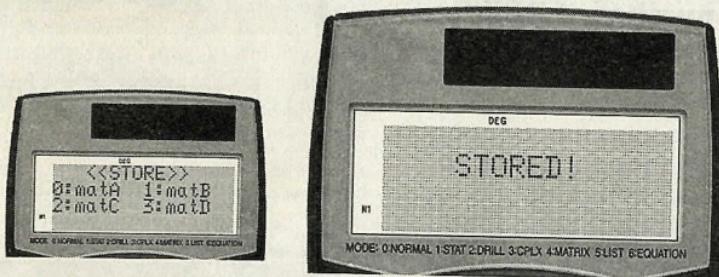
**Step 2. Input 4 as the number of COLUMNS and 4 as the number of ROWS for the coefficient matrix then input the elements.**

MATH	2	4	4	=	1	0	=
(-)	2	=	2	=	3	=	2
=	3	=	(-)	1	=	5	=
3	=	(-)	4	=	2	=	(-)
4	=	1	2	=	(-)	1	=
(-)	3	=	2	=			



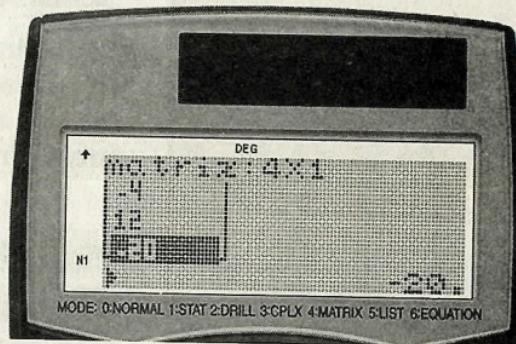
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mathematics

**Step 3. STORE the coefficient matrix in Matrix A.**



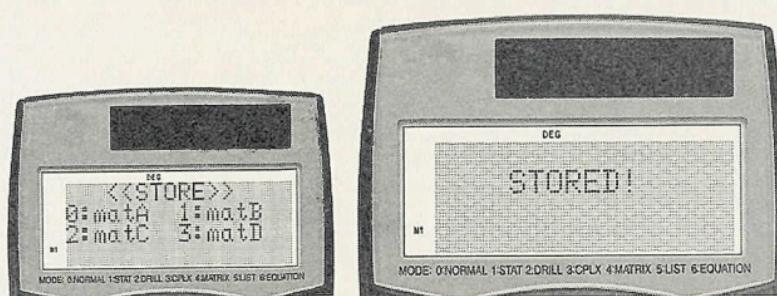
ON/C   MATH   4   0

**Step 4. Input the elements of the CONSTANT matrix**



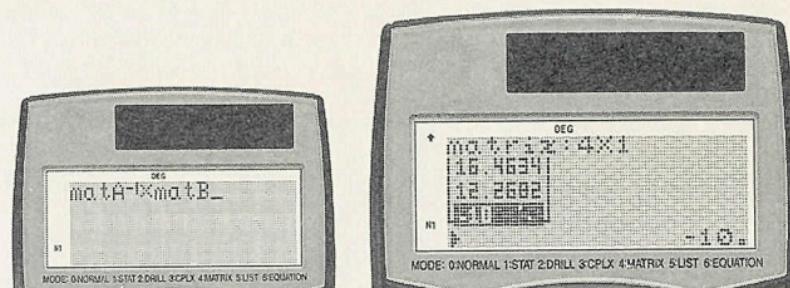
MATH   2   4   1   =   6   =  
 (-)   4   =   1   2   =   (-)  
 2   0   =

**Step 5. STORE the constant matrix in Matrix B.**



ON/C    MATH    4    1

**Step 6. Multiply the Inverse of Matrix A with Matrix B.**



MATH    1    0    2<sup>nd</sup> F    2  
×    MATH    1    1    =

The values of X, Y, Z, and W are 4.439, 16.463, 12.268 and 10 respectively.

**210**

**advanced  
mathematics**

the problem



is it?

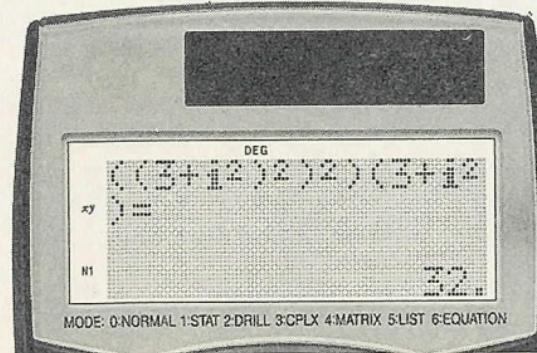


Evaluate the given expression.

$$(3 + i^2)^5$$

- A.  $16+5i$
- B. 32
- C. 25
- D.  $27i$

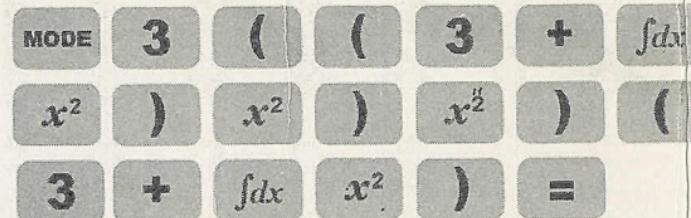
1



... and the Answer is!

**advanced mathematics**

**click This!**



**2**  
**the problem**



is it?

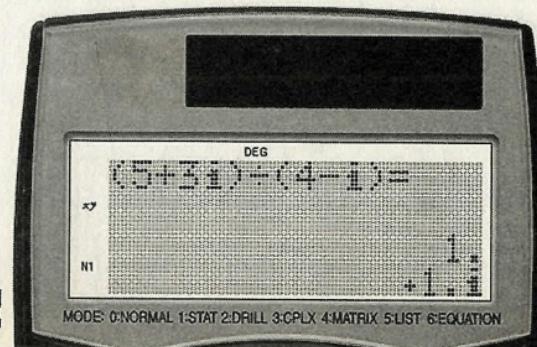
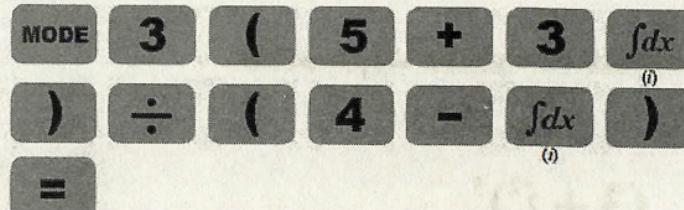
- A.  $2 - i$
- B.  $i$
- C.  $1 + i$
- D.  $7i$

What is the rationalized form of the expression.

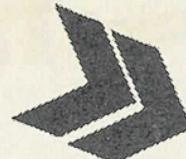
$$\frac{5 + 3i}{4 - i}$$

... and the **Answer** is!

click This!



the problem



is it?

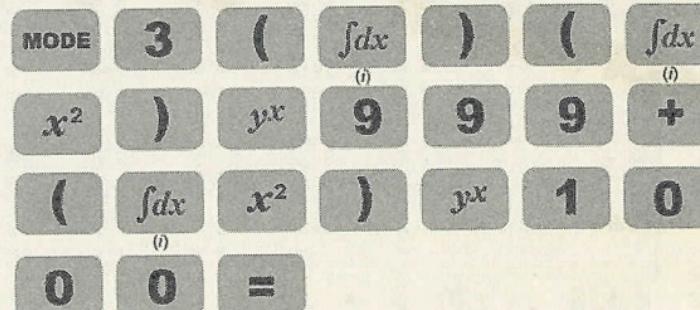
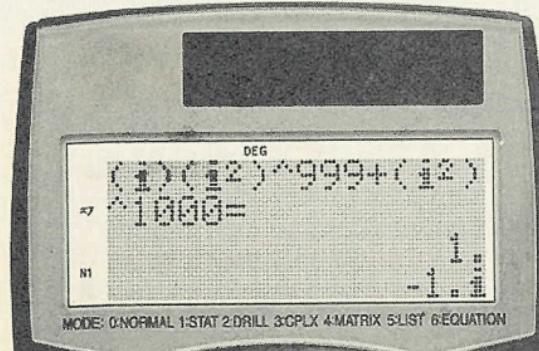


Evaluate the given expression:

$$i^{1999} + i^{2000}$$

- A.  $3i$
- B.  $2+i$
- C.  $2-i$
- D.  $1-i$

3



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mathematics  
**click This!**

...and the **Answer**

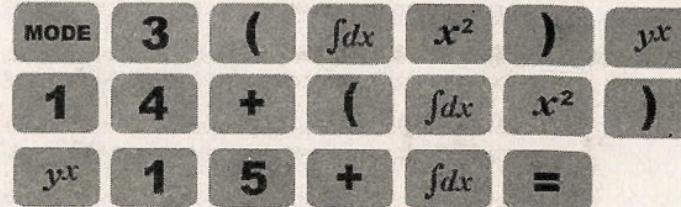
**4**  
the problem



is it?

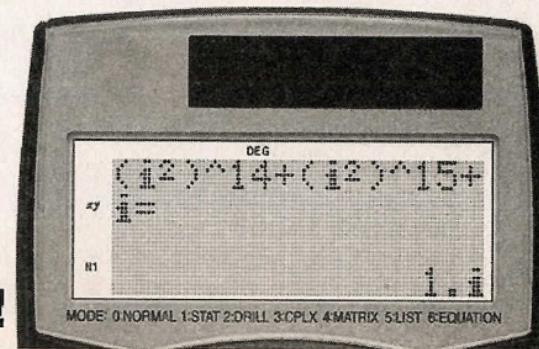
- A.  $i$
- B.  $2 + i$
- C.  $2 - i$
- D.  $1 - i$

click This!



Solve:

$$i^{28} + i^{30} + i$$



...and the **Answer** is!

the problem



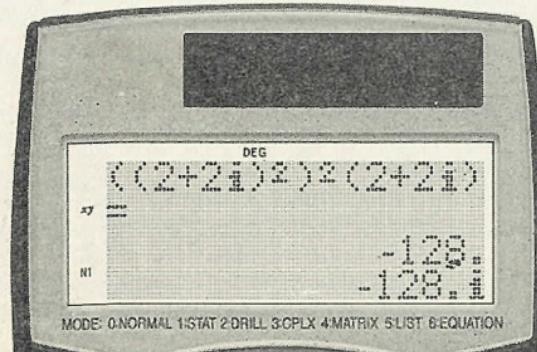
is it?

Simplify:

$$(2 + 2i)^5$$

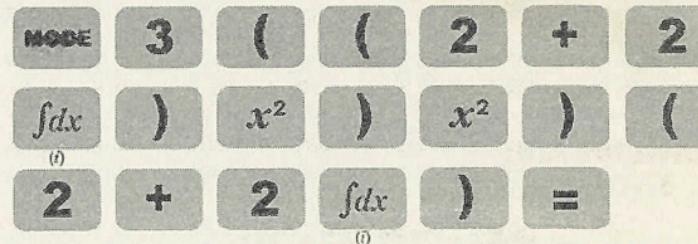
- A.  $100 - 100i$
- B.  $-128 - 128i$
- C.  $312 - 312i$
- D.  $500 - 500i$

5



... and the Answer is!

advanced  
mathematics  
**click This!**



**6**  
*the problem*



is it?

- A.  $39 + 14i$
- B.  $17 - 5i$
- C. 32
- D.  $16i$

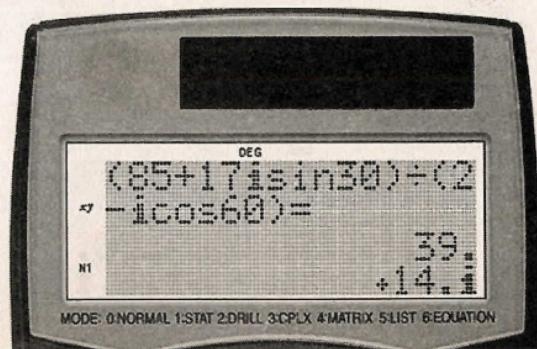
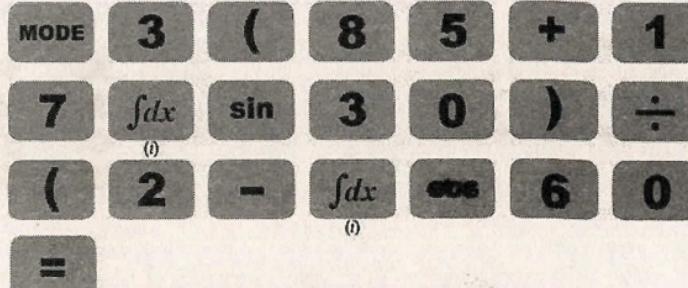
Solve for A/B:

$$A = 85 + 17i \sin 30$$

$$B = 2 - i \cos 60$$

Let's... and the Answer is!

click This!



*the problem*



*is it?*



What is the quotient when  
 $(5+7i)$  is divided by  $i^3$ ?

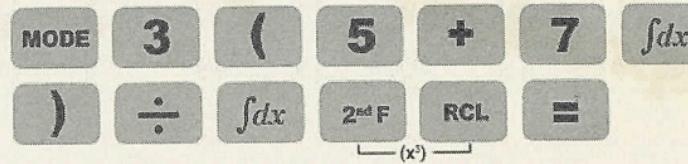
- A.  $-5 + 7i$
- B.  $5 + 5i$
- C.  $-7 + 5i$
- D.  $6i$

7



... and the **Answer** is!

advanced  
mathematics  
**click This!**



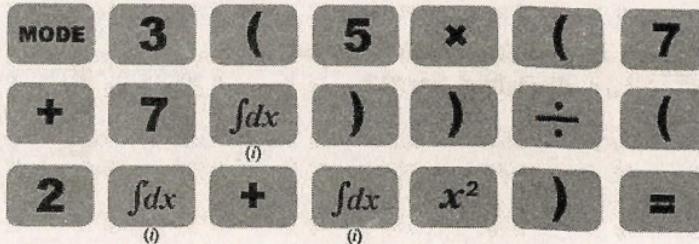
**8**  
**the problem**



is it?

- A.  $3i$
- B.  $45$
- C.  $7 - 21i$
- D.  $17i^2$

click This!



Find A/B:

$$A = 5(7 + 7i)$$

$$B = 2i + i^2$$

... another **Answer** is!



the problem  
is it?

Evaluate:

$$(3\angle 30)^9$$

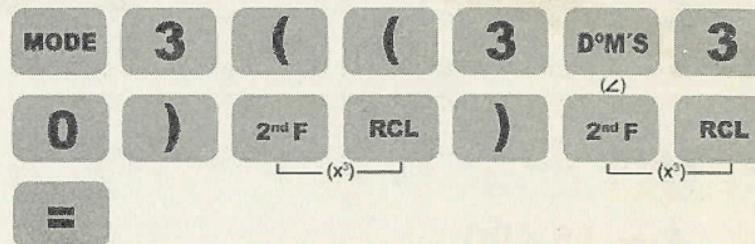
- A.  $999i$
- B.  $3939i$
- C.  $-19683i$
- C. 10000

9



... and the Answer is!

advanced  
**mathematics**  
**click This!**



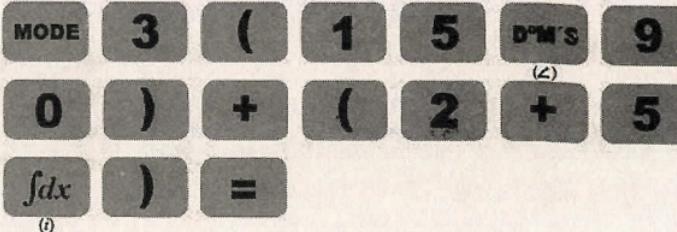
**10**  
the problem



is it?

- A.  $2 + 20i$
- B.  $4 + 40i$
- C.  $7i + 4$
- D.  $10i$

click This!



Find A+B:

$$A = 15\angle 90$$

$$B = 2 + 5i$$

... and the **Answer** is!



the problem



is it?



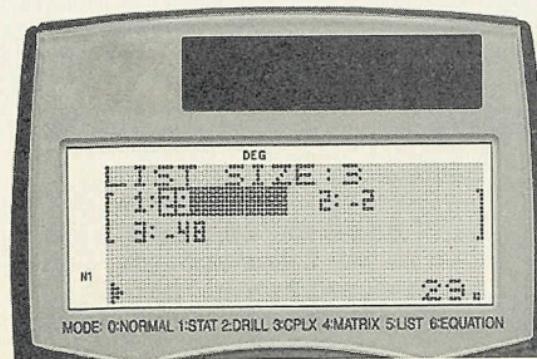
What is the outer product of the two vectors given?

$$A = \begin{pmatrix} 2 & 5 & 1 \end{pmatrix}$$

$$B = \begin{pmatrix} 1 & 2 & 6 & 7 \end{pmatrix}$$

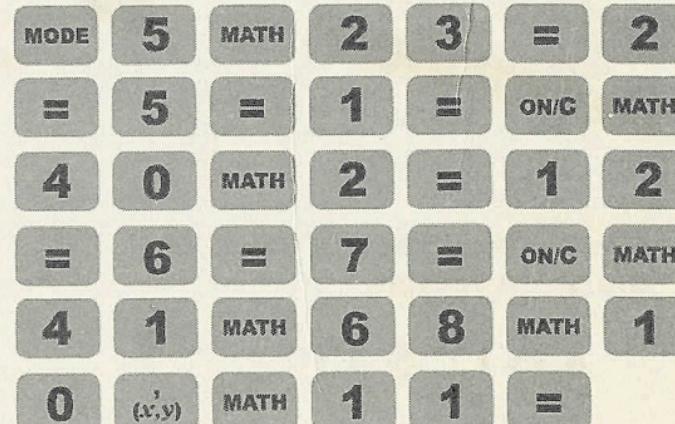
A.	(14	2	31)
B.	(29	-2	-48)
C.	(8	8	31)
D.	(14	8	11)

11



advanced  
mathematics

click This!



... and the Answer is!

# 222

advanced  
mathematics

# 12

the problem



is it?

- A. 17.69
- B. 69.17
- C. 15
- D. 16.88

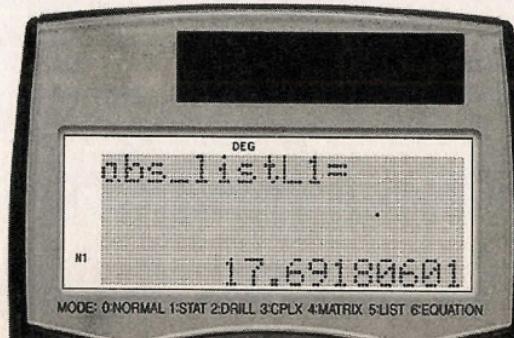
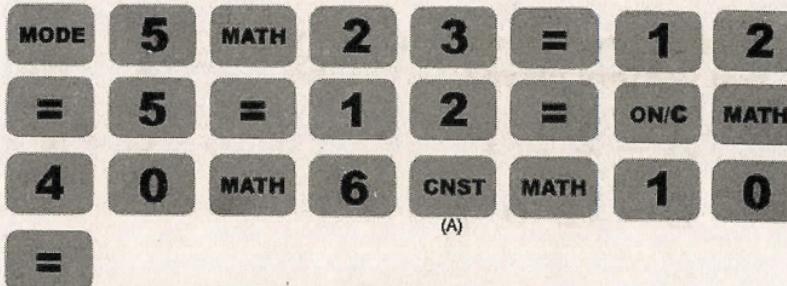
What is the absolute value of  
the given vector?

$$A = \begin{pmatrix} 12 & 5 & 12 \end{pmatrix}$$

... and the Answer is!



click This!



the problem



is it?

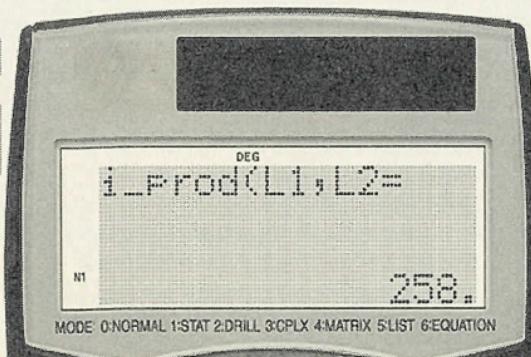


What is the dot product of the two vectors given?

$$A = \begin{pmatrix} 3 & 5 & 10 \end{pmatrix}$$

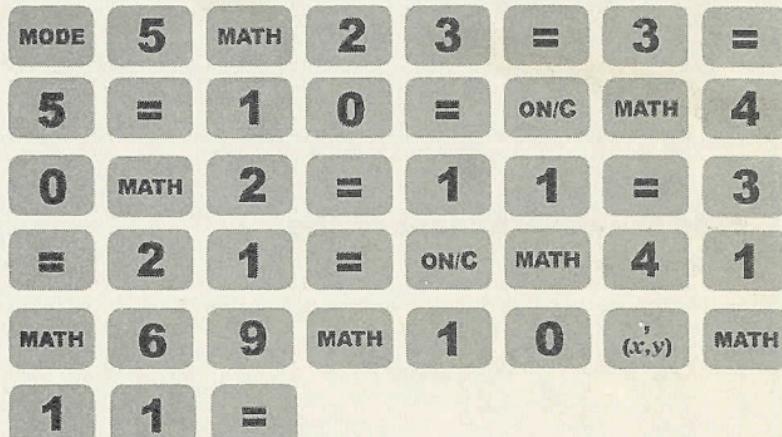
$$B = \begin{pmatrix} 11 & 3 & 21 \end{pmatrix}$$

13



advanced  
mathematics

click This!



... and the Answer is!

**14**  
*the problem*



is it?

- A. 30
- B. -22
- C. -20
- D. 18

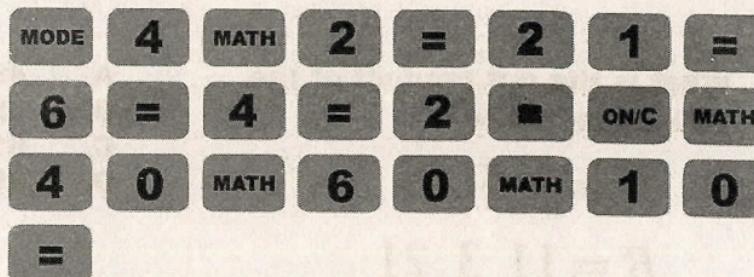
Find the determinant of the given matrix.

$$A = \begin{bmatrix} 2 & 6 \\ 4 & 2 \end{bmatrix}$$

... and the Answer is!



click This!



the problem



is it?



If Matrix C is the product of the inverse and the transpose of matrix A, what is the value of the unknown element K?

- A. 11
- B. 22
- C. 33
- D. 44

$$A = \begin{bmatrix} 5 & 9 \\ 7 & 3 \end{bmatrix} \quad C = \frac{1}{24} \begin{bmatrix} K & 3 \\ -5 & 17 \end{bmatrix}$$

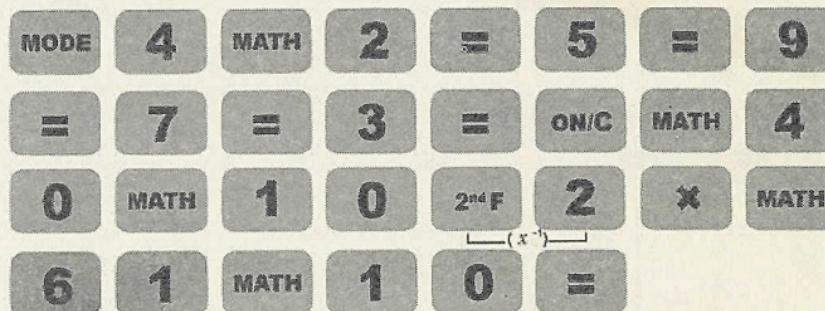
**15**



...and the Answer is!

advanced  
mathematics

click This!



# 16

*the problem*



is it?

- A. 69
- B. -74
- C. 85
- D. 45

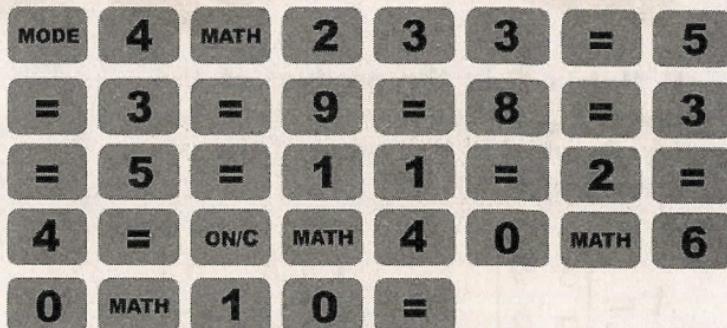
Find the determinant of the given matrix.

$$A = \begin{bmatrix} 5 & 3 & 9 \\ 8 & 3 & 5 \\ 11 & 2 & 4 \end{bmatrix}$$

... and the Answer is!



click This!



the problem  
is it?

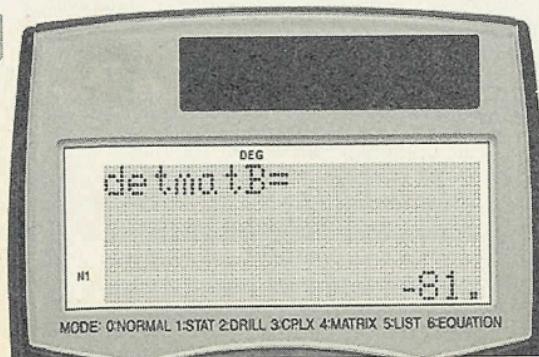


What is the determinant of Matrix B?

$$\text{Matrix } B = \begin{bmatrix} 5 & 8 & 7 \\ 9 & 3 & 1 \\ 2 & 2 & 3 \end{bmatrix}$$

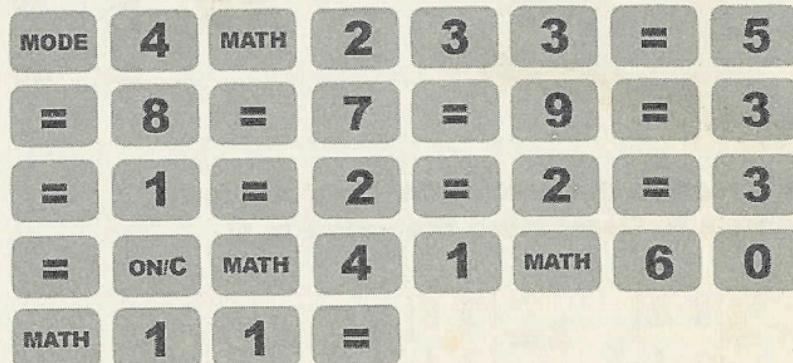
- A. 80
- B. -81
- C. 82
- D. -83

17



advanced  
mathematics

**click This!**



...and the Answer is!

**18**  
the problem



A. 10  
B. 20  
C. 30  
D. 40

is it?

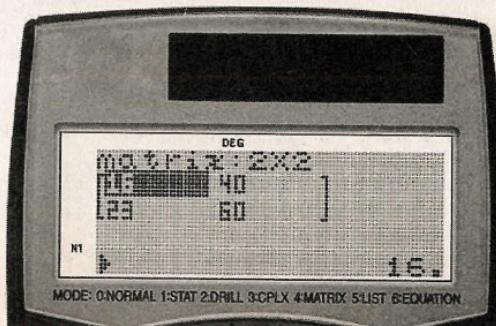
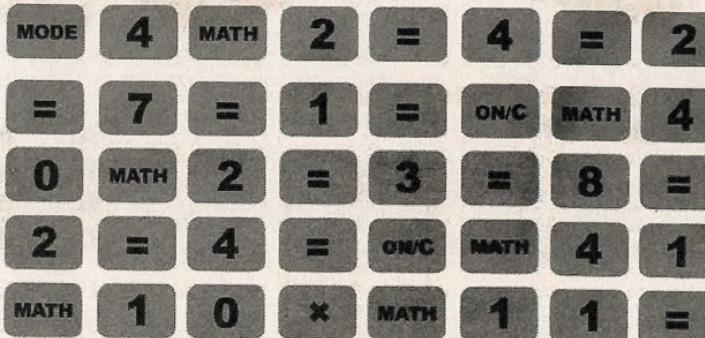
Matrix C is the product of Matrix A and Matrix B. Determine the value of Q.

$$A = \begin{bmatrix} 4 & 2 \\ 7 & 1 \end{bmatrix} \quad B = \begin{bmatrix} 3 & 8 \\ 2 & 4 \end{bmatrix} \quad C = \begin{bmatrix} 16 & Q \\ 23 & 60 \end{bmatrix}$$

...and the Answer is!



click This!



*the problem*



*is it?*



Find the determinant of the given matrix

$$B = \begin{bmatrix} 3 & 8 & 6 & 7 \\ 6 & 8 & 9 & 4 \\ 11 & 5 & 1 & 4 \\ 2 & 1 & 2 & 1 \end{bmatrix}$$

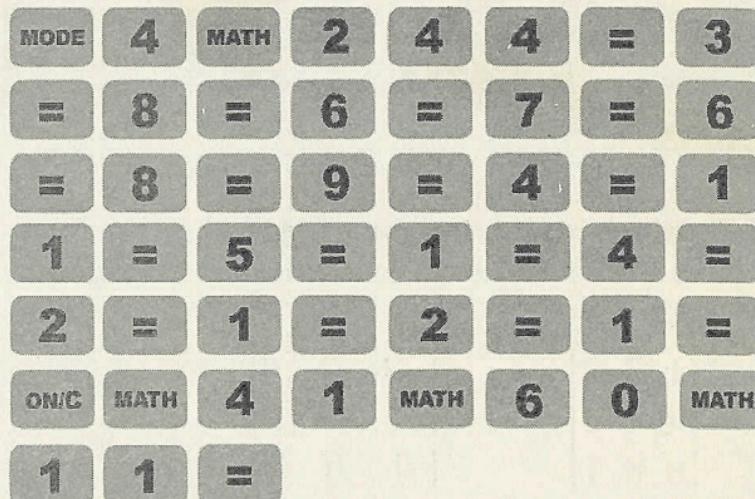
- A. 300
- B. 294
- C. 420
- D. 100

# 19



advanced  
mathematics

**click This!**



... and the **Answer** is!

# 20

*the problem*



is it?

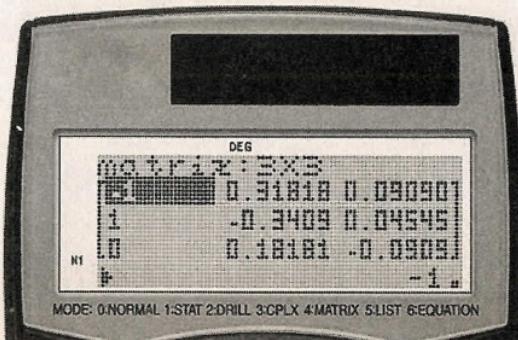
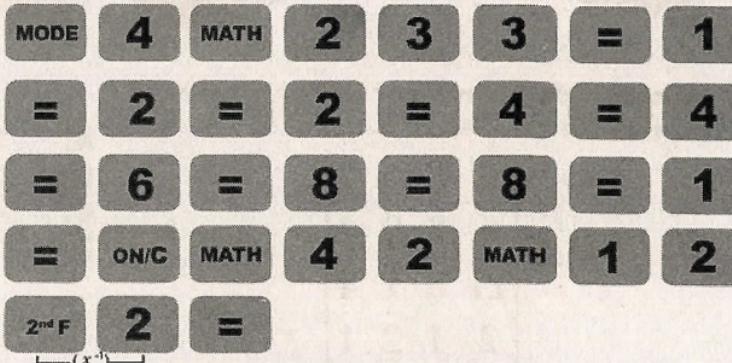
- A. 44
- B. 1
- C. 2
- D. 8

If Matrix A is the inverse of Matrix C, then what is the value of X?

$$C = \begin{bmatrix} 1 & 2 & 2 \\ 4 & 4 & 6 \\ 8 & 8 & 1 \end{bmatrix} \quad A = \begin{bmatrix} -1 & C & T \\ X & -R & Y \\ 0 & H & Z \end{bmatrix}$$



click This!



the problem



is it?



advanced  
mathematics

**click This!**

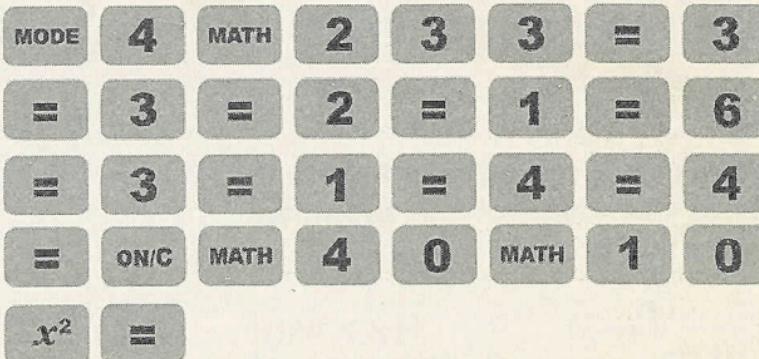
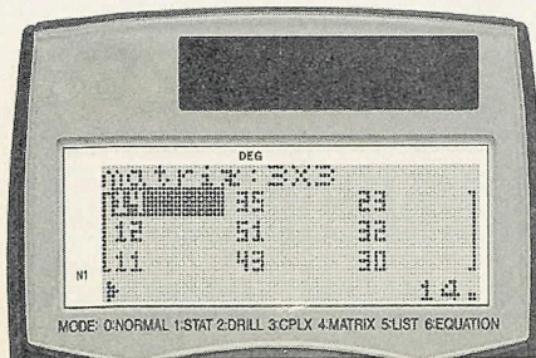
If Matrix B is the square of Matrix A, find the value of Z.

$$A = \begin{bmatrix} 3 & 3 & 2 \\ 1 & 6 & 3 \\ 1 & 4 & 4 \end{bmatrix}$$

$$B = \begin{bmatrix} X & 35 & 23 \\ 12 & 51 & 32 \\ 11 & 43 & 30 \end{bmatrix}$$

- A. 14
- B. 11
- C. 12
- D. 13

21



... another Answer is!

**22**  
the problem



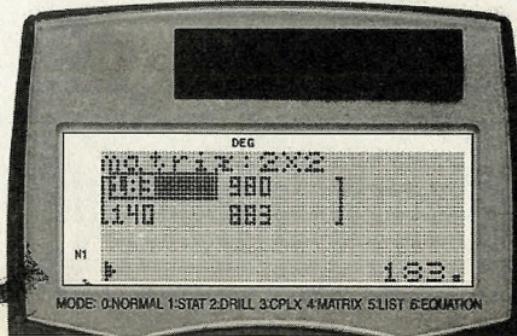
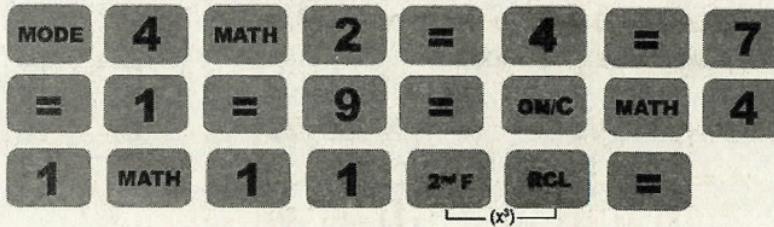
is it?

Matrix C is the cube of Matrix B.  
Find the value of the unknown  
element D.

$$B = \begin{bmatrix} 4 & 7 \\ 1 & 9 \end{bmatrix} \quad C = \begin{bmatrix} 183 & 980 \\ D & 883 \end{bmatrix}$$

- A. 100
- B. 120
- C. 140
- D. 160

click This!



... and the Answer is...

the problem



is it?

advanced  
mathematics

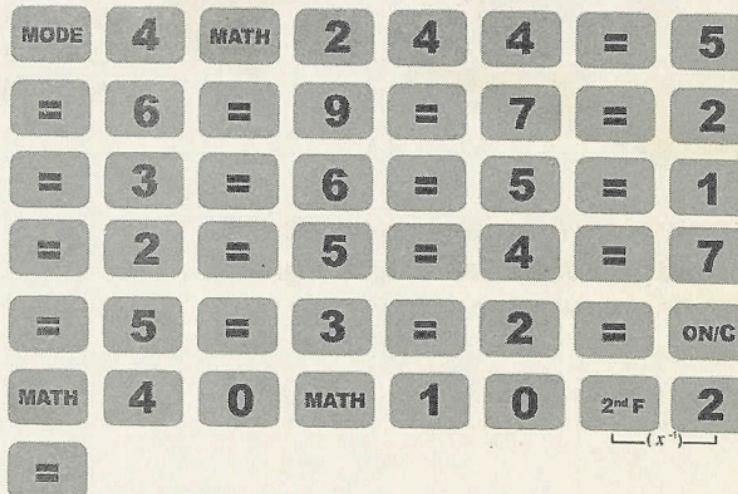
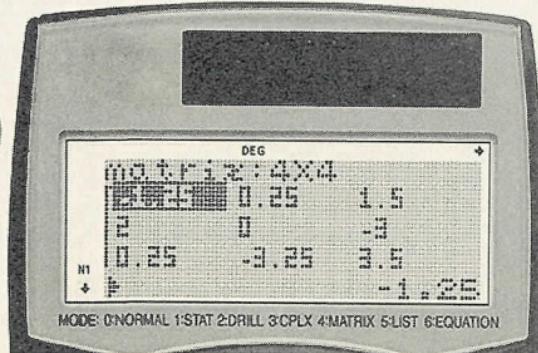
click This!

**Find the value of the unknown element M if Matrix B is the inverse of Matrix A.**

$$A = \begin{bmatrix} 5 & 6 & 7 & 9 \\ 2 & 3 & 6 & 5 \\ 1 & 2 & 5 & 4 \\ 7 & 5 & 3 & 2 \end{bmatrix} \quad B = \begin{bmatrix} -1.25 & 0.25 & 1.5 & 0.75 \\ 2 & M & -3 & -1 \\ 0.25 & -3.25 & 3.5 & 0.25 \\ -1 & 4 & -3 & 0 \end{bmatrix}$$

A. 1  
B. 2  
C. 3  
D. 0

23



... and the Answer is!

# 234

advanced  
mathematics

# 24

the problem



is it?

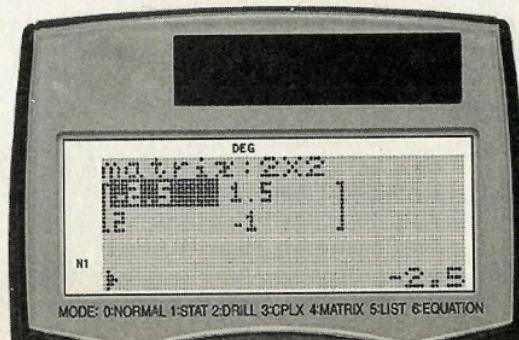
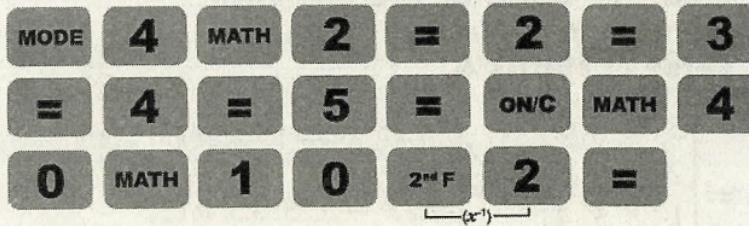
Matrix B is the inverse of Matrix A. Find the value of x in the given matrix calculation.

$$A = \begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix} \quad B = \begin{bmatrix} -2.5 & 1.5 \\ X & -1 \end{bmatrix}$$

- A. 1
- B. 2
- C. 3
- D. 4



click This!



... and the Answer is!

the problem



Find the value of W in the given system of linear equations.

$$5w + 3x + 4y - 5z = -6$$

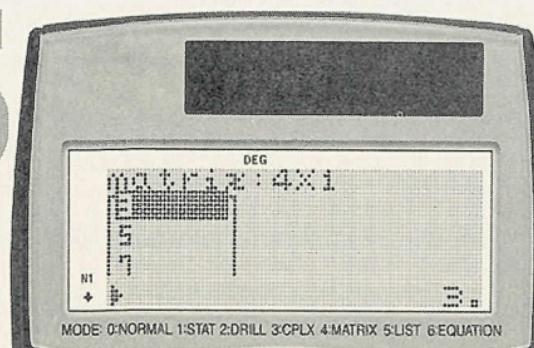
$$6w + 7x - 8y + 9z = 96$$

$$10w + 11x + 12y + 13z = 312$$

$$14w + 15x + 16y + 17z = 416$$

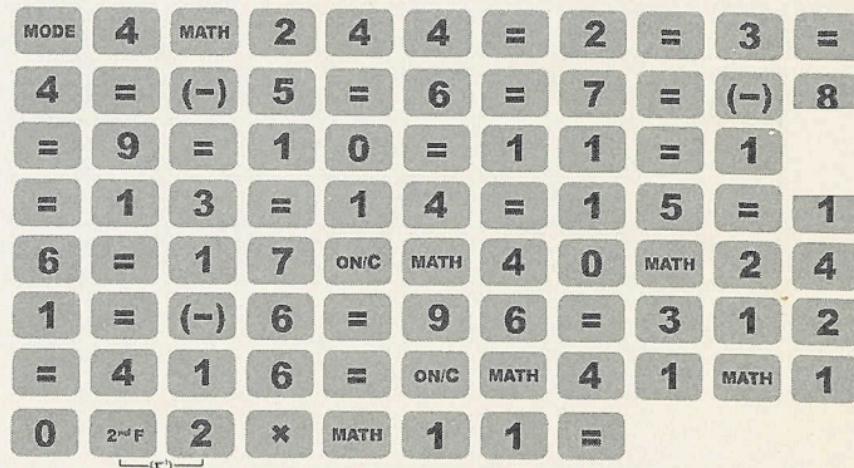
- A. 3
- B. 5
- C. 7
- D. 11

# 25



advanced  
mathematics

**click This!**



... and the **Answer** is!

**236**

**miscellaneous**

# T rigonometry

Most trigonometric problems can be directly solved by any regular scientific calculator. That is, input the data and you arrive at the answer by simply pressing the equal sign. However, some problems require “tricks” in order to arrive at solutions that seem unsolvable by regular calculators. Yes that’s true, you can solve questions that require you to prove half angle formula, double angle formula, and the Law of Tangent to name a few. You can do this by applying the same procedure used in the previous Chapters and that is by substitution.

**miscellaneous**

*Example 1: Proving  
Simplify:*

$$\frac{\cos x \csc x}{\cot^2 x}$$

- A. **Cosx**
- B. **Tanx**
- C. **Sinx**
- D. **Cotx**

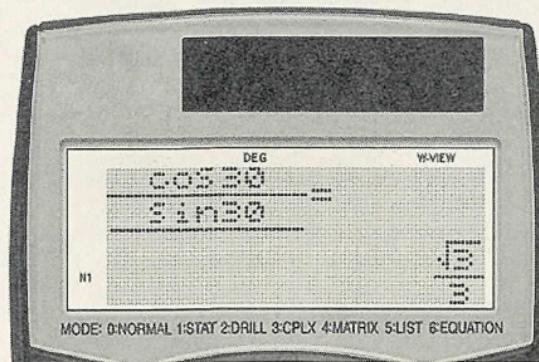
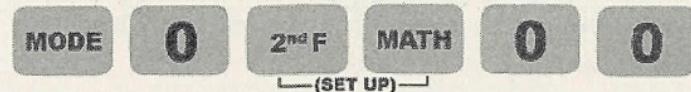
Solving Example 1 requires Trial and Error solution. You have to assume an arbitrary constant and substitute it to the value of X in the main equation. Doing so would give you to a certain answer that you should store in your memory. Next is to try each of the given choices by substituting the same arbitrary constant. The choice that will give an answer similar to the answer of the main equation is the correct answer. The procedure can be summarized as follows. This is called the Calculator Math Procedure

*Calculator Mathematics Procedure*

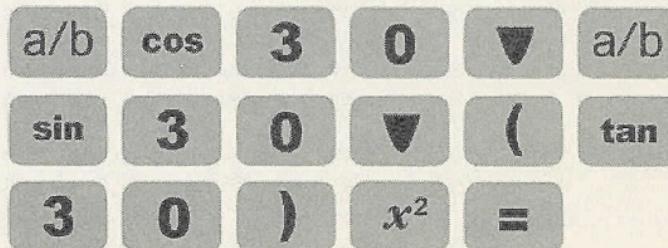
1. Get an arbitrary constant. The arbitrary constant must not make the denominator zero in the main equation and in any of the choices when substituted.
2. Substitute the arbitrary constant in the main equation and take note of the answer.
3. Substitute the arbitrary constant in the choices and take of the answer for each choice.
4. Compare the answer of the main equation to the answer of the choices.

*Solution:*

**Step 1.** Make sure calculator is in NORMAL and DEGREE mode.



**Step 2.** Input the entire equation correctly. Assume arbitrary constant equal to 30 and solve for the answer.



**miscellaneous**

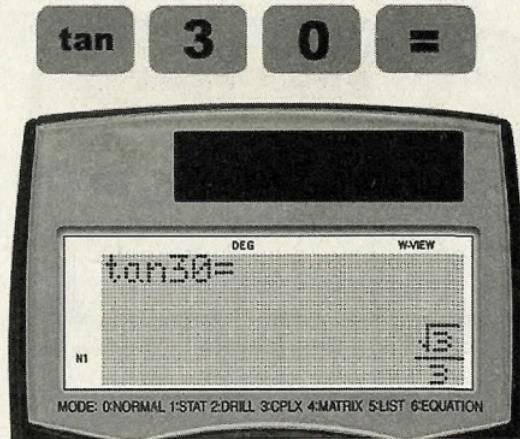
**Step 3. Solve for the corresponding answer of each choice using the same arbitrary constant.**

*Table 7.1 Answers of the choices when 30 is substitute as a value for X*

Choices	Answers
Cos x	0.866025403
Sin x	0.5
Tan x	0.577350269
Cot x	1.732050808

By comparison, the correct answer is **tanx** since we arrived at the same value.

**Step 4. Compare the answer of the choices to the answer of the main equation to determine the correct answer.**



## Geometry

Since your calculator doesn't have the feature of graphing, which is very essential in Geometry, you are only limited to some geometric problems which can be solved by applying other mathematical methods like calculus and matrices. Other types of problems can be solved by other special types of calculators.

### How to solve for the area bounded by 3 points?

While the school method in solving for area in geometry needs you to memorize some two equations before getting the area of a triangular figure in a coordinate axis, the solution in getting the area using your calculator can be simpler if you apply the method of Matrix. In solving Example 2, using the method of determinants with the help of a calculator will take a much lesser time.

If you are given point A, ( $x_1, y_1$ ), point B ( $x_2, y_2$ ), and point C ( $x_3, y_3$ ). The area bounded by them can be solved using equation 7.1 by following the format given in matrix A. The points must be arranged in a counterclockwise manner.

$$\text{Matrix } A = \begin{bmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{bmatrix}$$

$$A = \frac{1}{2} d \quad (\text{equation 7.1})$$

**A** = area bounded by point  
A, B, and C

**d** = determinant of Matrix A

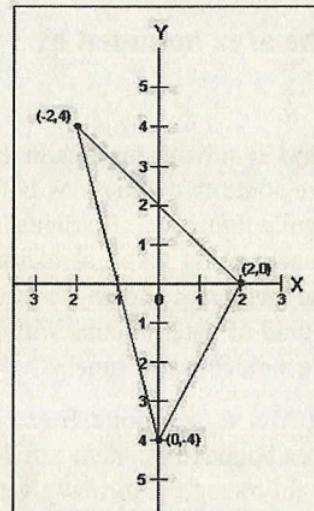
## miscellaneous

*Example 2: Area of a Triangle*

Find the area bounded by the points  $(2,0)$ ,  $(-2,4)$ , and  $(0,-4)$ .

A. 14  
B. 12

C. 24  
D. 28



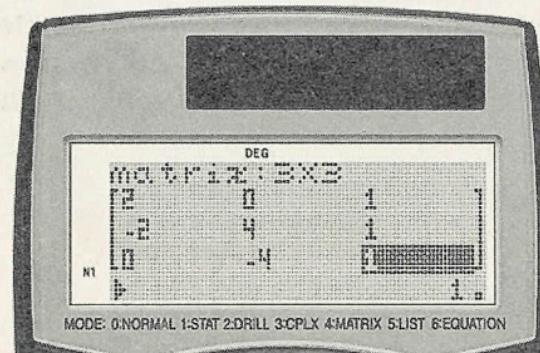
*Solution:*

Step 1. Go to MATRIX mode. Input the correct number of rows, columns, and the elements of the matrix. Save the matrix.

MODE	4	MATH	2	3	3	=
2	=	0	=	1	=	(-)
2	=	4	=	1	=	0
(-)	4	=	1	=	ON/C	

Step 2. Solve for the determinant of the matrix.  
Then get the area using the formula using determinants.

MATH    4    0    MATH    6    0  
MATH    1    0    ÷    2    =



*Example 3: Single Data Analysis*

Find the population standard deviation of the given data:

5,12,16,20,22,25,29,38,41

A. 12.50  
B. 11.02

C. 13.50  
D. 20.35

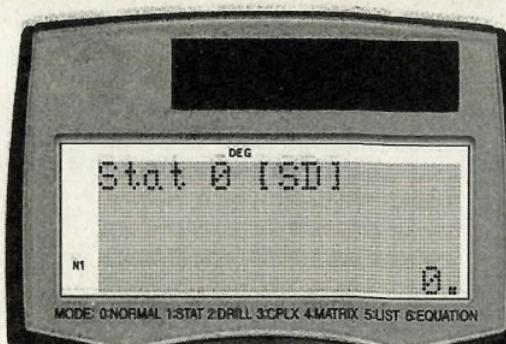
### Statistics

Seven statistical calculations can be performed with your SHARP EL – W506. You can access these functions by pressing MODE followed by the number 1. The first choice (MODE, 1, 0) is to be pressed when performing a single-data (SD) statistical calculation. The remaining choices are for paired variable analysis.

*Solution:*

**Step 1. Go to STAT mode. Select the number that corresponds to SD (Single Variable Analysis)**

MODE      1      0

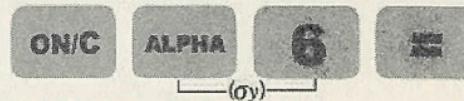


## miscellaneous

**Step 2.** Input all the data to your calculator.



**Step 3.** Solve for the population standard deviation of the set of data.



## miscellaneous

*Example 4: Linear Regression*

A car traveling east with a constant acceleration has the following data for velocity and time it travels. Find the velocity of the car after 1 minute.

Time (sec)	Final Velocity ( $V_f$ )
1	8.5
2	11
3	13.5
5	18.5
10	31

A. 120.70      C. 125.25  
 B. 122      D. 156

## How to solve linear regression?

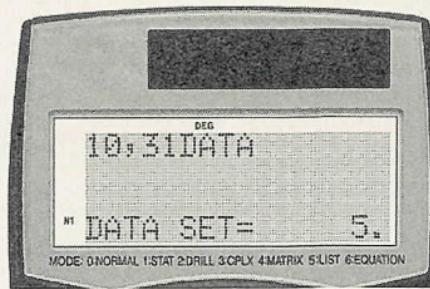
From physics, the formula for solving the final velocity of a constantly accelerating body is given by equation 7.2.

$$V_f = V_o + at \quad (\text{equation 7.2})$$

where  $V_f$  = final velocity  
 $V_o$  = initial velocity  
 $a$  = acceleration  
 $t$  = time

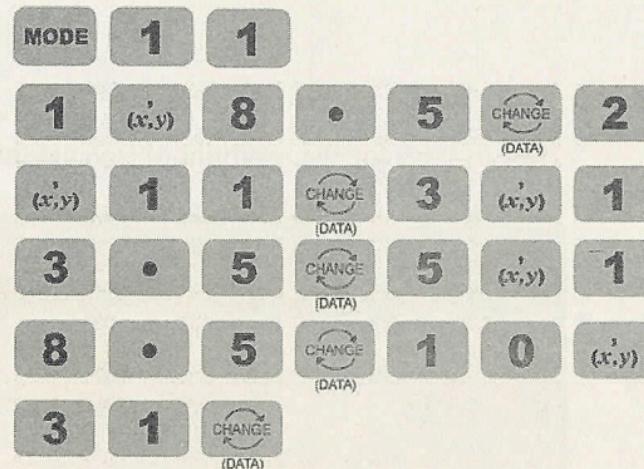
The equation in solving for final velocity is linear in nature. That is why you can solve for the final velocity of the car in the given example using linear regression. The proper keys are given in table 7.

## miscellaneous



**Solution:**

**Step 1. Go to STAT mode and select the number that corresponds to linear regression (LINE). Enter the pairs of data.**



**Step 2. Solve for the unknown value.**

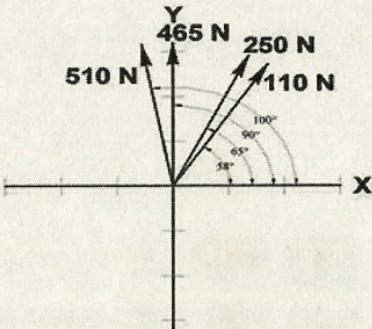


**Mechanics**

One of the most important parts of mechanics where you can apply the use of your calculator is in the computation of resultant of forces for vectors. Forces can be represented by complex numbers and both polar and rectangular forms can be used.

In the rectangular form,  $a + bi$ ,  $a$  is the x-coordinate of the force while  $b$  is the y-coordinate of the force.

In polar form on the other hand,  $r\angle\theta$ ,  $r$  is the scalar value of the force while  $\theta$  represents the angle.



How to solve for the resultant of concurrent forces?

**Example 5: Resultant Force**

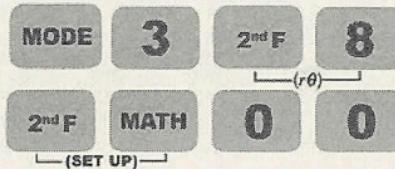
**What is the direction of the resultant force of vectors?**

A. 95.25°	C. 86.65°
B. 110°	D. 101.6°

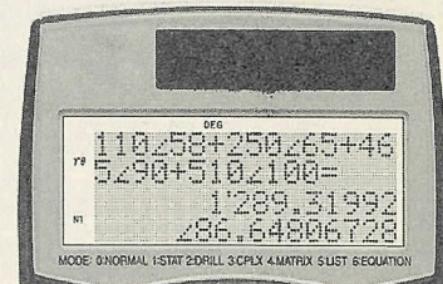
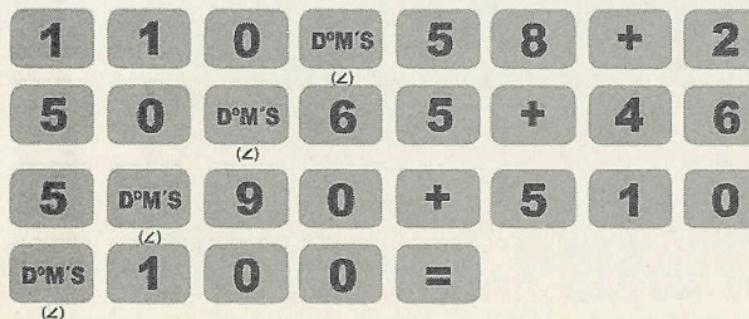
## miscellaneous

*Solution:*

**Step 1.** Go to COMPLEX mode. Make sure Calculator is in DEGREE mode. Set the complex mode to polar format.



**Step 2.** Add the forces and solve for the answer.



**miscellaneous****Engineering Economy**

It's amazing how scientific calculators can work their magic even in solving Engineering Economy problems. This justifies that even without a business calculator on hand, being knowledgeable with scientific calculators such as SHARP EL – W506 will make a student's computation in Engineering Economy simpler to handle.

***Example 6: Straight Line Depreciation***

A 2008 Model Toyota Fortuner bought at P1,485,000 has an estimated salvage value of half a million pesos. How much is its book value after 7 years if it has an estimated life of 15 years and was found to depreciate linearly?

- A. P1,025,333.50
- B. P935,788.50
- C. P1,233,200.00
- D. P950,065.00

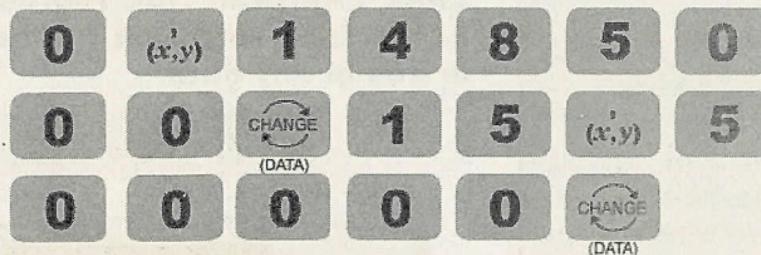
***Solution:***

**Step 1. Go to STAT mode. Select LINEAR regression ( LINE).**

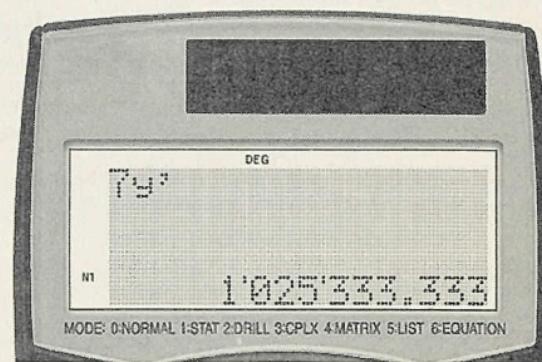
MODE      1      1



*Step 2. Input the correct data.*



*Step 3. Solve for the unknown value.*



**miscellaneous***Example 7: Declining Balance Depreciation*

Five months ago, Khiel bought a brand new car for Php760,000. He was told that his car is depreciating at a constant percentage with time. His salesman further told him that the brand new car has a life of 8 years and by then, the salvage value will be 22% of the initial cost. How many more months from now will it take for the book value to be exactly half the original cost?

- A. 44 months
- B. 39 months
- C. 50 months
- D. 17 months

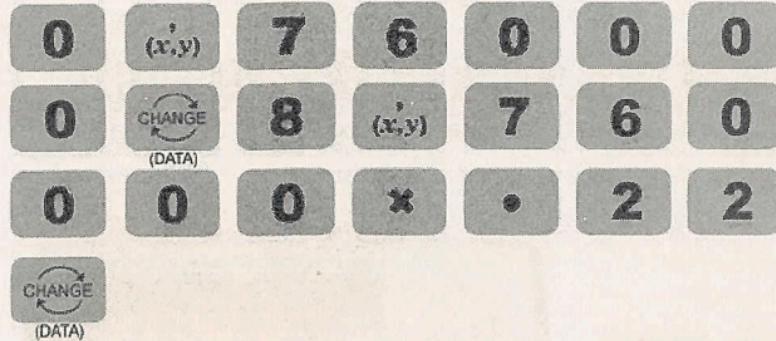
*Solution:*

Step 1. Go to STAT mode. Select GENERAL EXPONENTIAL regression (G\_EXP). Make sure that the calculator is free of any data.

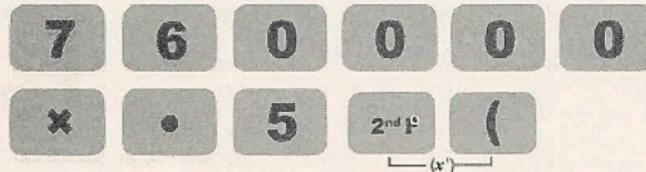
MODE    1    7



**Step 2. Input the correct data.**



**Step 3. Solve for the unknown value.**



Convert the solved value into months and minus the initial 5 months.

## miscellaneous

*Example 8: Continuous Compound Interest*

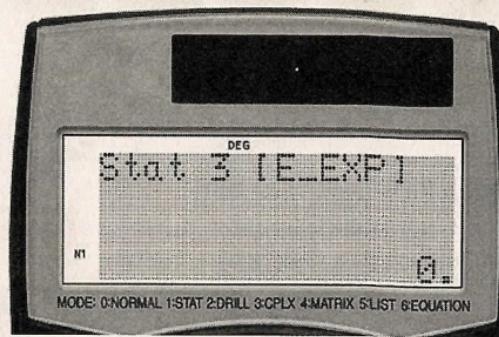
If a nominal interest rate compounded continuously is given on an account, my initial investment of P500,000 doubles in 5 years. How long will it take before my money quadruples?

- A. 8 years
- B. 10 years
- C. 12 years
- D. 15 years

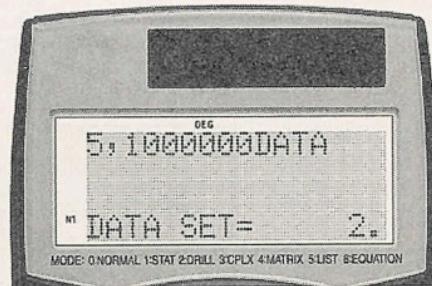
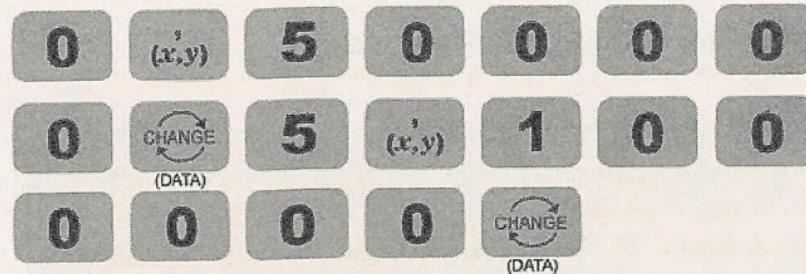
*Solution:*

**Step 1. Go to STAT mode. Select EULER EXPONENTIAL (E\_EXP). Make sure that the calculator is free of any data.**

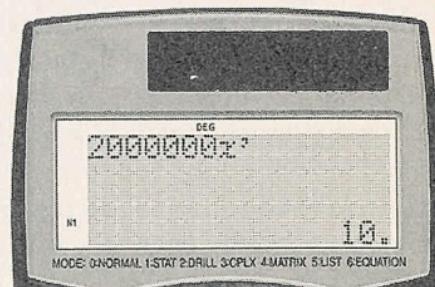
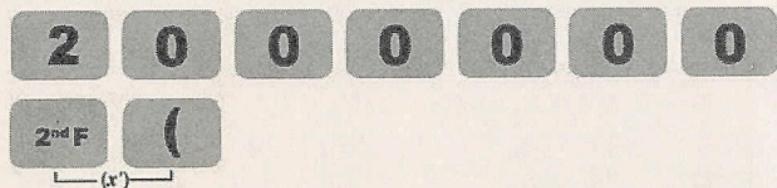
MODE      1      3



*Step 2. Input the correct data.*



*Step 3. Solve for the unknown value.*



## Differential Equations

It's a challenge for anyone who uses an ordinary scientific calculator to find its real applications in this particular subject knowing that nobody attempted to do this using his or her calculator in the past. It is because the solutions in this subject are often express as a function and not as a number which is the usual display in a regular scientific calculator. There are however applications in differential equations which requires particular solutions and your SHARP EL-W506 can help you in that department.

### Applications in First Order Differential Equations

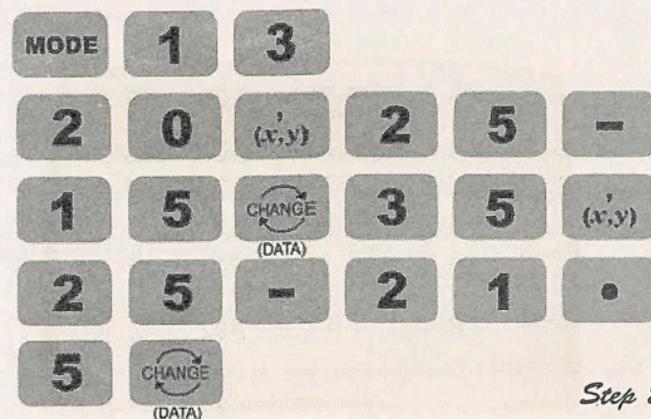
#### *Example 9: Temperature Problem*

A thermometer from the outside was brought in a room where the temperature is constant at 25 deg C. Twenty seconds later, the thermometer reads 15 deg C. An additional 15 seconds later, the thermometer reads 21.5 deg C. What was the thermometer reading 5 seconds after it was brought in the room?

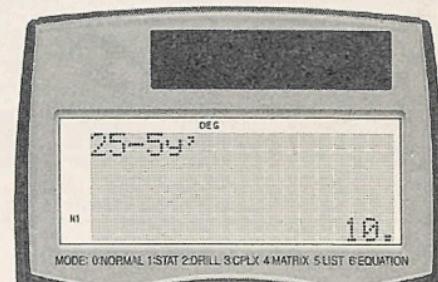
- A. 5 deg C
- B. 8.50 deg C
- C. 12 deg C
- D. 10 deg C

*Solution:*

**Step 1.** Go to STAT mode. Select EULER EXPONENTIAL (E\_EXP).  
 Make sure that the calculator doesn't contain old data. Input  
 the correct data.



**Step 2.** Solve for the unknown value.



## miscellaneous

*Example 10: Decay Problem*

Radium decomposes at a rate proportional at any instant. In 100 years, 100 mg of Radium decomposes to 96 mg. What is the half-life of Radium?

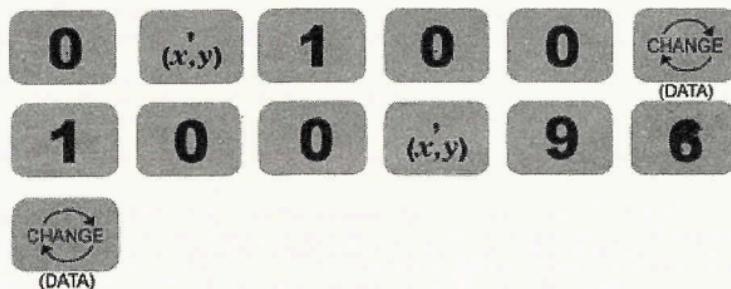
- A. 1000 years
- B. 1500 years
- C. 1698 years
- D. 1783 years

*Solution:*

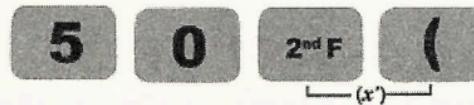
**Step 1. Go to STAT mode. Select EULER EXPONENTIAL (E\_EXP). Make sure that the calculator is free of any data.**



**Step 2.** Input the correct data.



**Step 3.** Solve for the unknown value.



**260**

**miscellaneous**

the problem



is it?

Which of the following is equivalent to  $\sin 2A$ ?

- A.  $2\sin A$
- B.  $\cos 2A$
- C.  $2\sin A \cos A$
- D.  $\cos A \sin A$

1



*Solution:* Assume angle is 1 degree

sin    2    =

2    sin    1    cos    1    =

... and the Answer is!

# 262

## miscellaneous

2  
the problem



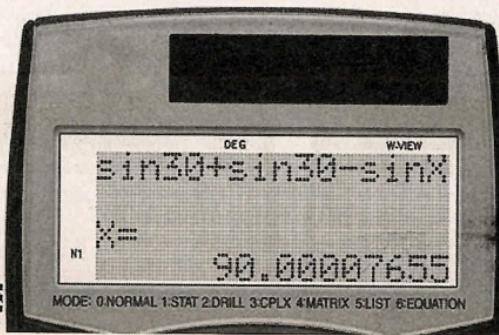
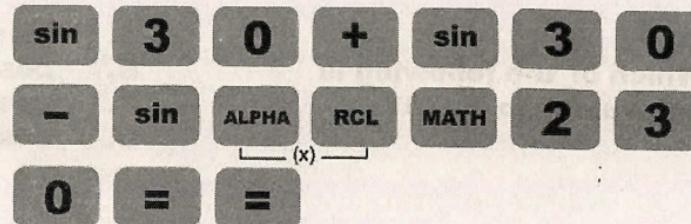
is it?

- A. 30
- B. 60
- C. 90
- D. 120

Find the value of X.

$$\sin 30 + \sin 30 = \sin X$$

click This!



... and the Answer is

the problem



is it?



## miscellaneous

**click This!**

Solve for X:

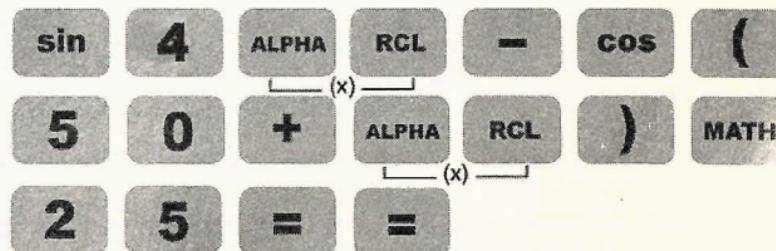
$$\sin(4X) = \cos(50 + X)$$

- A. 5
- B. 8
- C. 30
- D. 25

3



*Solution: Assume initial value of iteration is the first choice. (x=5)*



... and the **Answer is!**

## miscellaneous

4  
the problem



is it?

Simplify:

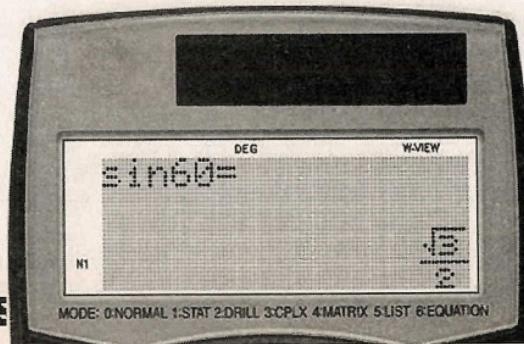
$$\frac{2\tan x}{1 + \tan^2 x}$$

- A.  $\sin 2x$
- B.  $\sec 2x$
- C.  $\cos 2x$
- D.  $\tan 2x$

click This!

*Solution: Assume angle is 30 degrees.*

a/b    2    tan    3    0    ▼  
 1    +    (    tan    3    0  
 )     $x^2$     =  
 sin    6    0    =



...and the **Answer** is

the problem



is it?



**Find the area of the figure formed bounded when points (0,0), (4,2), and (2,6) when the are joined together on a Cartesian plane.**

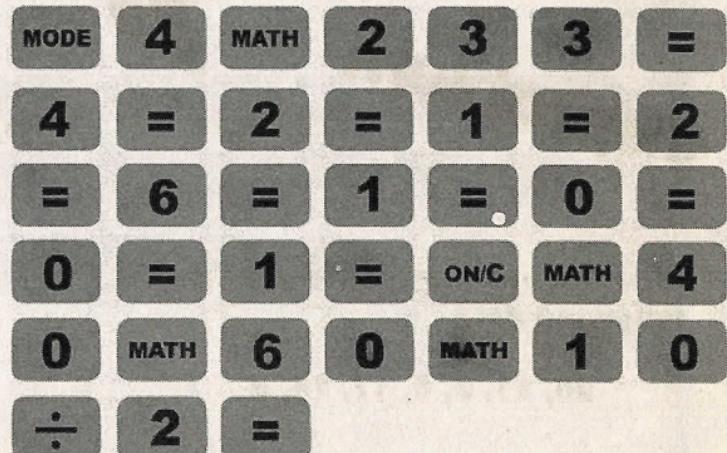
- A. 5 square units
- B. 10 square units
- C. 9 square units
- D. 8 square units

5



## miscellaneous

**click This!**



... and the **Answer** is!

# 6 the problem



is it?

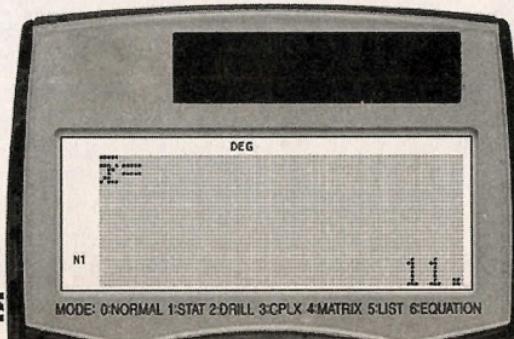
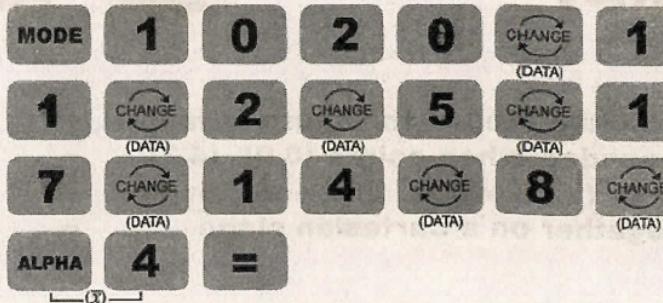
- A. 14
- B. 8
- C. 11
- D. 17

**Find the arithmetic mean of the following data.**

**20, 11, 2, 5, 17, 14, 8**

...and the Answer is

**click This!**



**the problem**



**is it?**



**Find the area of the figure formed bounded by points  $(0,4)$ ,  $(2,0)$ , and  $(-2, 4)$  when they are joined together on a Cartesian plane.**

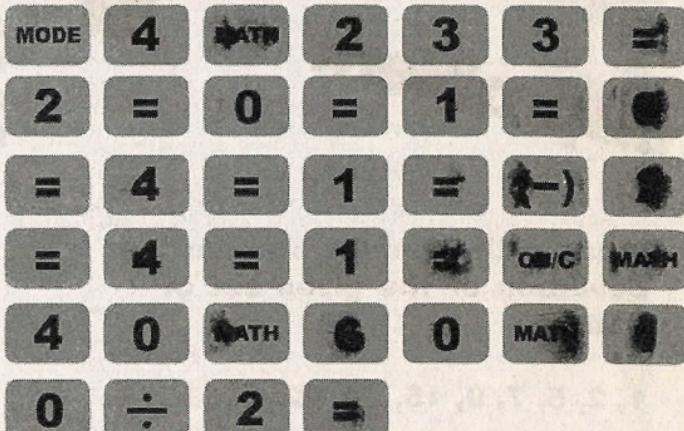
- A. 6 square units
- B. 12 square units
- C. 4 square units
- D. 10 square units

**7**



## miscellaneous

**click This!**



**... and the Answer is!**

# 268

## miscellaneous

# 8

the problem



is it?

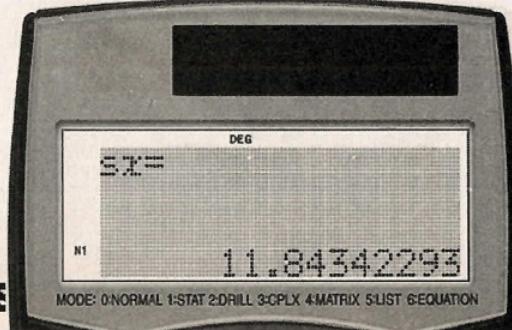
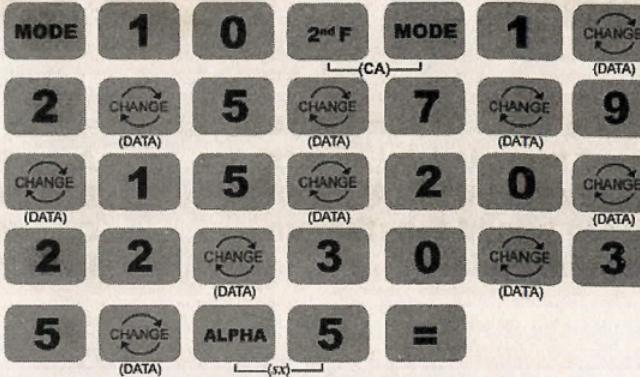
- A. 11.84
- B. 15.17
- C. 24.22
- D. 9.11

What is the sample standard deviation of the given set of data?

1, 2, 5, 7, 9, 15, 20, 22, 30, 35

...and the Answer is

click This!



the problem



is it?



## miscellaneous

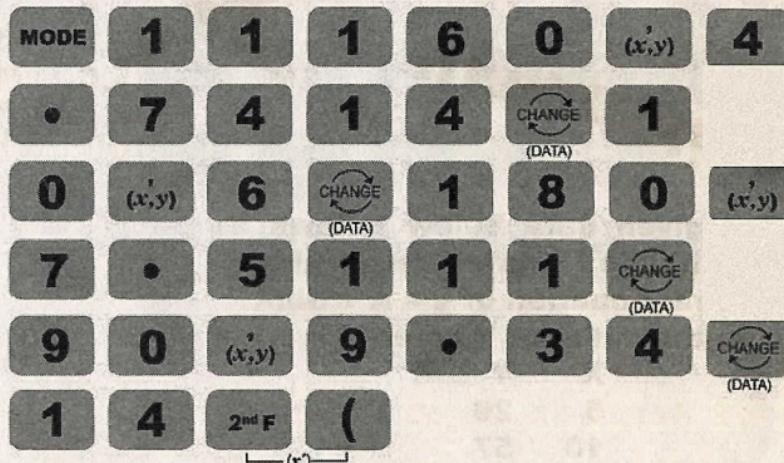
**click This!**

The absolute pressure of saturated water is given in the table below taken at different temperatures. If it follows a linear regression, find the temperature if the pressure is 14 psia.

T (° F)	P (psia)
160	4.7414
170	6.0000
180	7.5111
190	9.3400

- A. 220.9558
- B. 221.3966
- C. 222.1524
- D. 219.2511

9



... and the **Answer** is!

## miscellaneous

**10**  
the problem



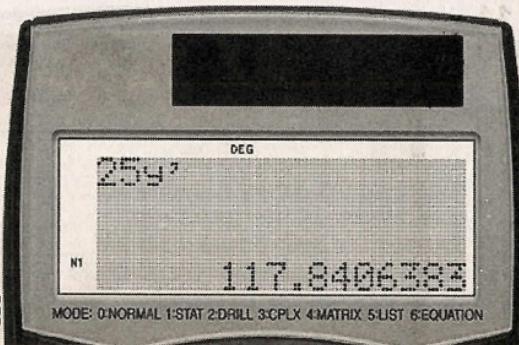
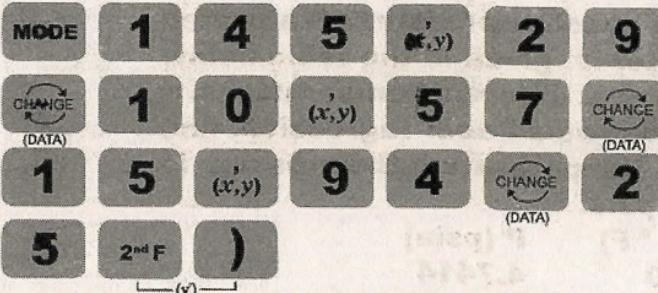
is it?

click This!

The given data below follows a logarithmic regression with a general equation of  $y = A + B\ln X$ . Find the value of Y when X is 25.

X	Y
5	29
10	57
15	94

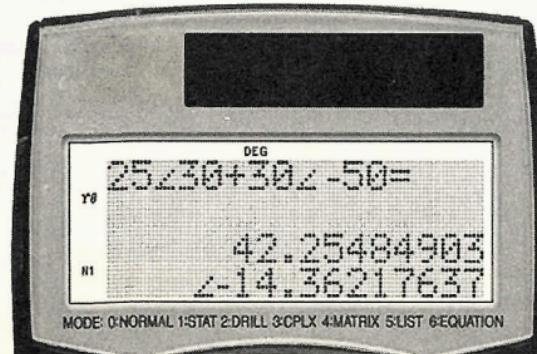
- A. 120.11
- B. 117.84
- C. 125.01
- D. 133.33



...and the Answer is

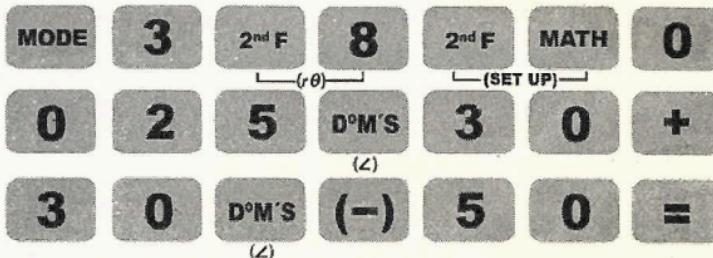
**click This!**

1 1



What is the resultant force of vector A having a magnitude of 25N and directed 30° and vector B of magnitude 30N directed at -50°?

- A. 15N
- B. 42N
- C. 5N
- D. 10N



... and the **Answer** is!

## miscellaneous

**12**  
the problem



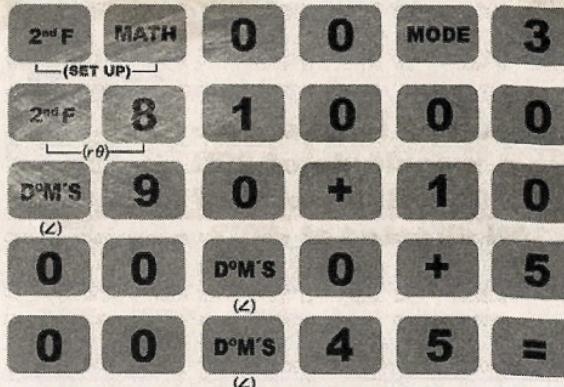
What is the resultant force  
of vectors A, 1000N North,  
B, 1000 N East, and C, 500N  
Northeast?

- A. 2000, 45°
- B. 1914.21, 45°
- C. 2123.55, 45°
- D. 1952.23, 45°

is it?



click This!



...and the **Answer** is

the problem



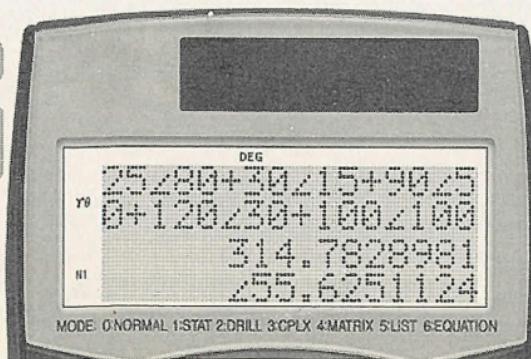
is it?



What is the direction of the resultant force of vectors A (25N,  $80^\circ$ ), B (30N,  $15^\circ$ ), C (90N,  $50^\circ$ ), D (120,  $30^\circ$ ), and E (100,  $100^\circ$ )?

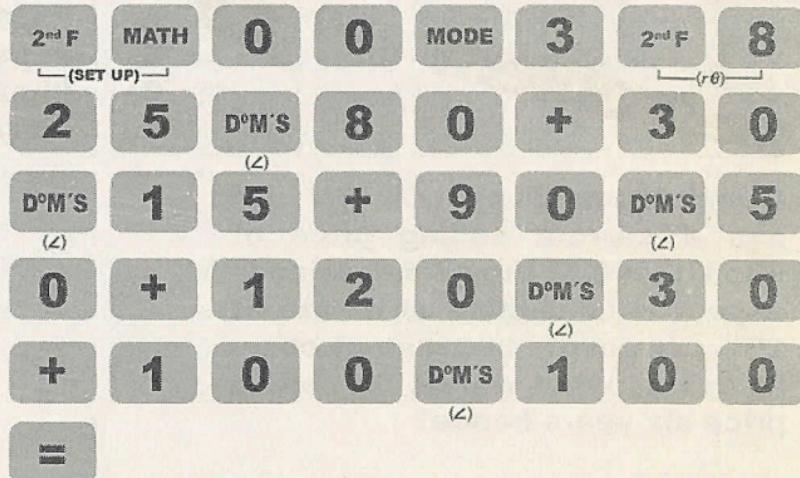
- A.  $45.25^\circ$
- B.  $55.625^\circ$
- C.  $65.25^\circ$
- D.  $50.11^\circ$

13



## miscellaneous

click This!



... another Answer is!

**14**  
the problem



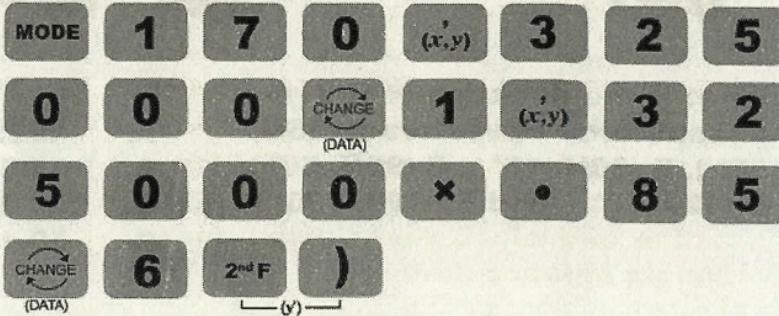
Grand Wega Sony LCD TV 65" has a current selling price of Php325,000. If the selling price is expected to decline at a rate of 15% per annum because of obsolescence, what will be its selling price six years hence?

- A. Php122,574
- B. Php120,003
- C. Php215,676
- D. Php198,909

is it?



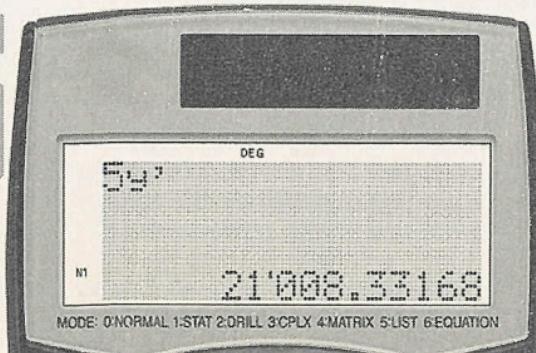
click This!



...and the **Answer** is

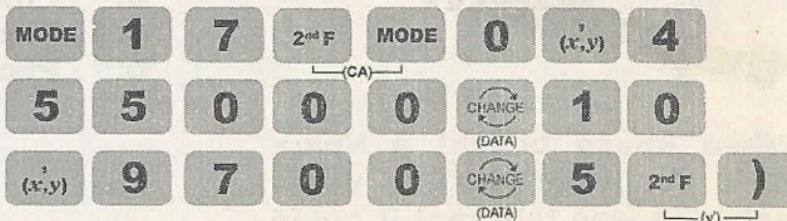
**click This!**

15



What is the current book value of an HP Pavillion Computer purchased 5 years ago at Php 45,500 with a salvage value of Php9,700 at the end of 10 years using declining balance method.

- A. Php21,000
- B. Php22,000
- C. Php20,000
- D. Php20,500



... and the **Answer** is!

# 16

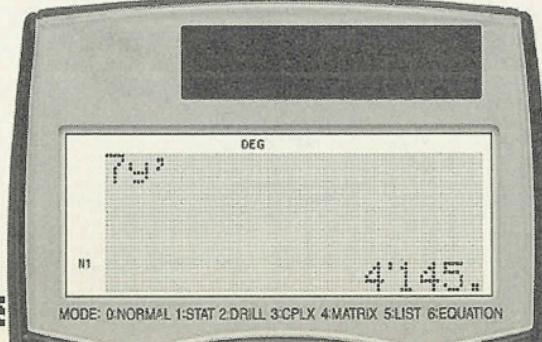
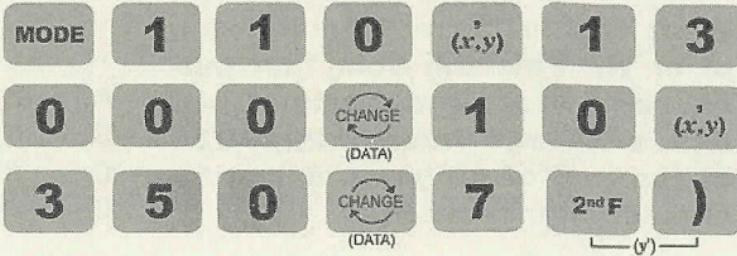
*the problem*



is it?

When Rhena bought a Nokia 5210 for Php13,000 5 years ago, she was told that it could be sold as a scrap after being used for 10 years. If the scrap value is Php350, determine the book value two years from now if it depreciates linearly.

- A. Php3,459
- B. Php4,145
- C. Php4,234
- D. Php6,765



...and the **Answer**

*the problem*



*is it?*



The population of a country doubles in 50 years. How many years will it be five times as much? Assume that the rate of increase is proportional to the number of inhabitants,

- A. 105 years
- B. 123 years
- C. 116 years
- D. 111 years

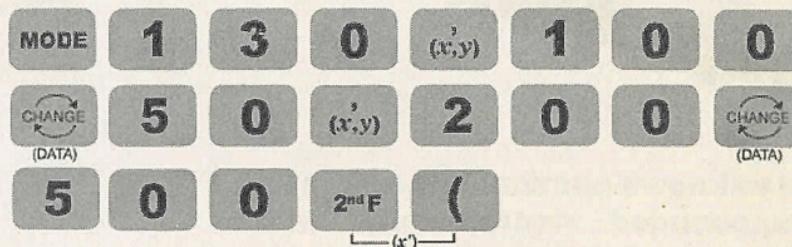
17



... and the **Answer** is!

## miscellaneous

*click This!*



## miscellaneous

**18**  
the problem



is it?

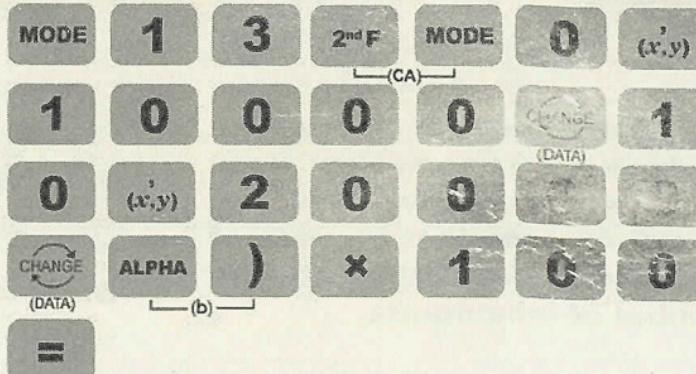
- A. 5%
- B. 6%
- C. 7%
- D. 8%

An unknown nominal interest rate compounded continuously will make my P10,000 double in 10 years. What is the nominal interest rate?

...and the **Answer** is

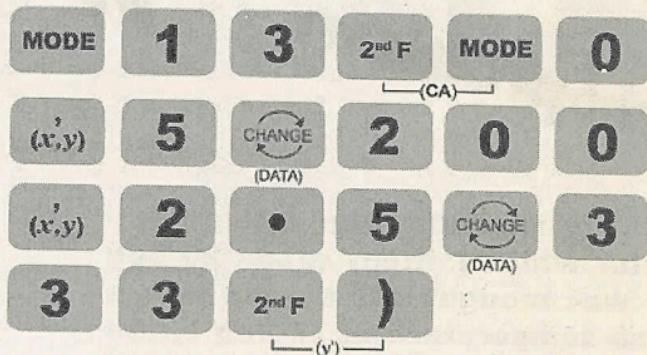


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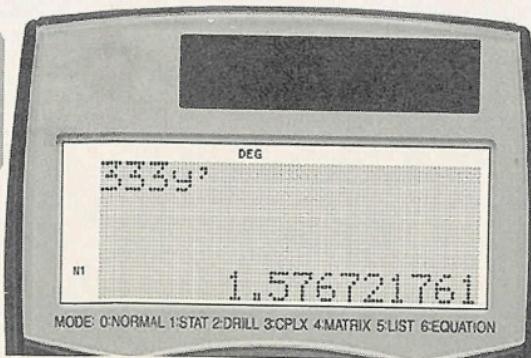
## miscellaneous

**click This!**



... and the **Answer** is!

19



the problem



is it?

5 mg of Carbon 12 has a half life of 200 years. How much Carbon 12 will be left from a 5 mg sample after 333 years?

- A. 1.577 mg
- B. 0.456 mg
- C. 2.100 mg
- D. 2.004 mg

## miscellaneous

**20**  
the problem



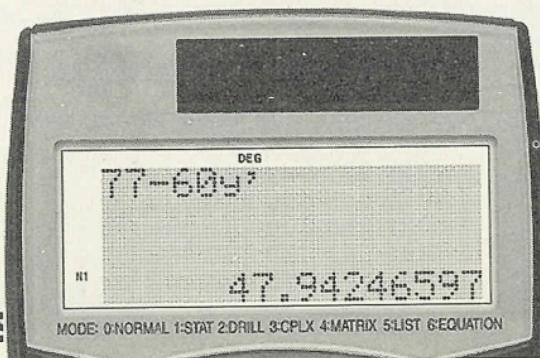
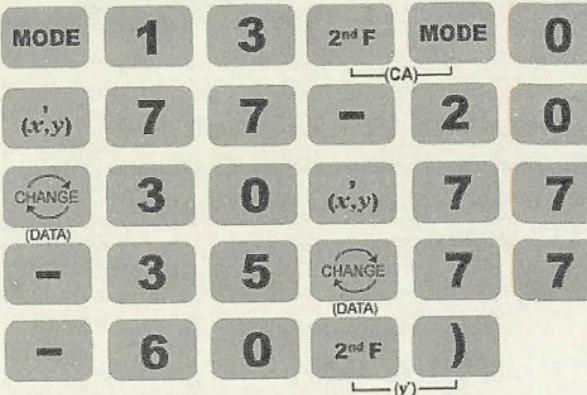
is it?



Thirty seconds after a thermometer which initially reads 20 deg F was brought into a room where the temperature is 77 deg F, the reading becomes 35 deg F. Determine the thermometer reading after one minute.

- A. 65 deg F
- B. 48 deg F
- C. 71 deg F
- D. 75 deg F

click This!



...and the Answer is

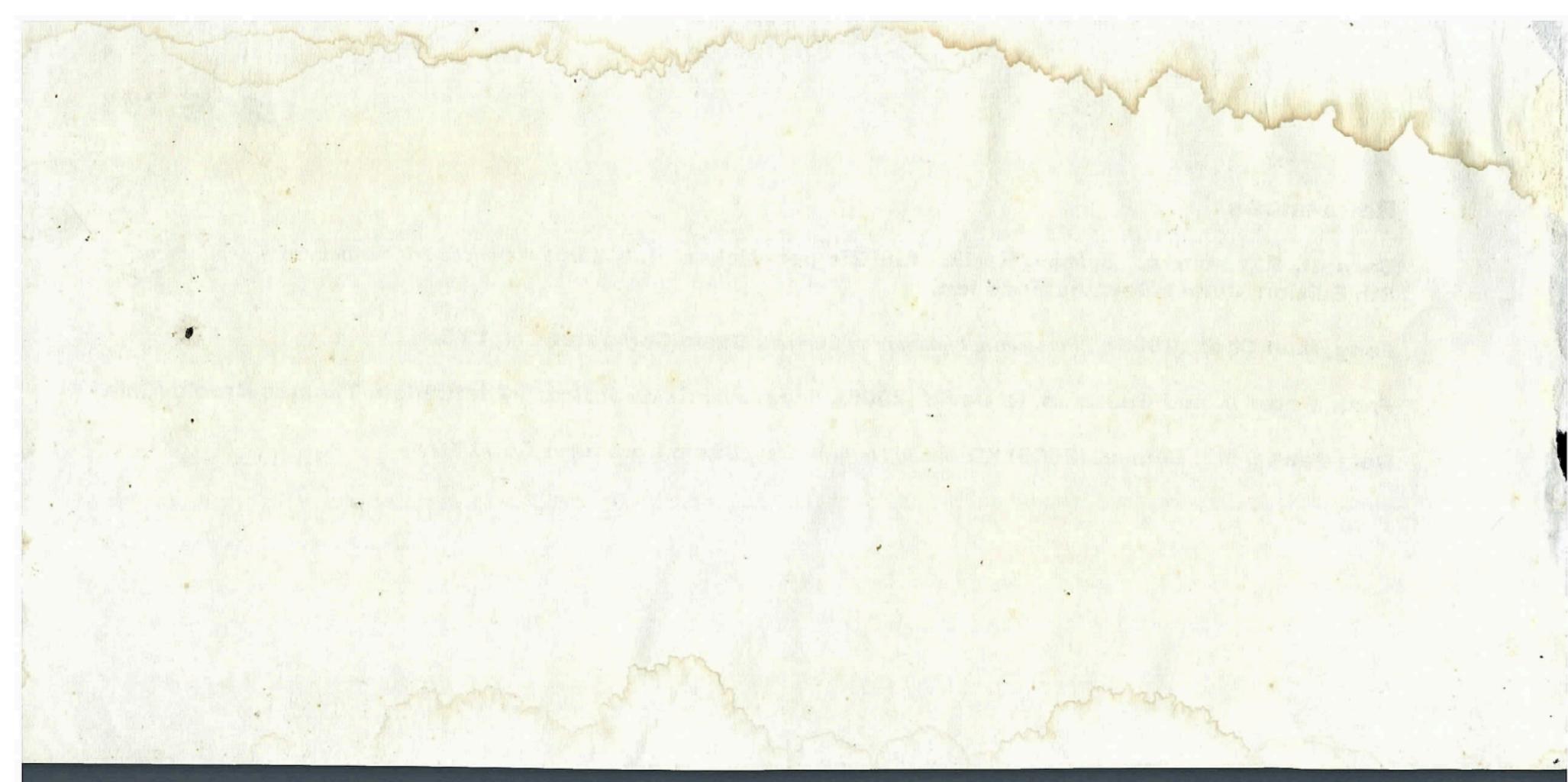
## References

**Barnett, Raymond A., Byleen, Karl E., and Ziegler Michael R., (2006), "Analytic Trigonometry with Applications", 8th Edition, John Miley and Sons Inc.**

**Fong, Mun Chou (2005), "Parametric Equations of Curves", Casio Computer Co., LTD**

**Frisk, Peter D. and Gustafon, R. David (2005), "Algebra for College Students", 7th Edition, Thomas Brooks/Cole**

**Dela Penas, Ma. Loiuse, (2005) "Financial Mathematics", Casio Computer Co., LTD**



**enr. reynold m. agustin** is a mathematician by heart. he finished **bachelor of science in chemical engineering** at the royal and pontifical **university of santo tomas** in 2004. while in school, he was a consistent achiever and even became the **first scholar of a us-based organization** during college.

his impressive record during the **2004 chemical engineering board exam** gave him his passport in the **review center** as he is now working as a part-time **board examination reviewer** for several engineering disciplines. In 2006, he released **calculatormathematics**. in less than a month, several thousand copies had been sold and at 25, he finds himself giving lectures to the top Universities all over the country.

**calculatormathematics** is the **first and only** existing **mathematics reviewer** that simplifies mathematics by incorporating the use of a powerful calculator in order to solve complex Math problems. The chapters in the book include all the subjects that **enr. agustin** handles in his review classes. these are **algebra, trigonometry, analyticalgeometry, differential and integralCalculus, statistics, mechanics, differentialequations, engineeringeconomy and advancedmathematics**.

apart from being a **board exam reviewer** and writing **engineering books**, **enr. agustin** also owns a company and a **marco polo wannabe...**